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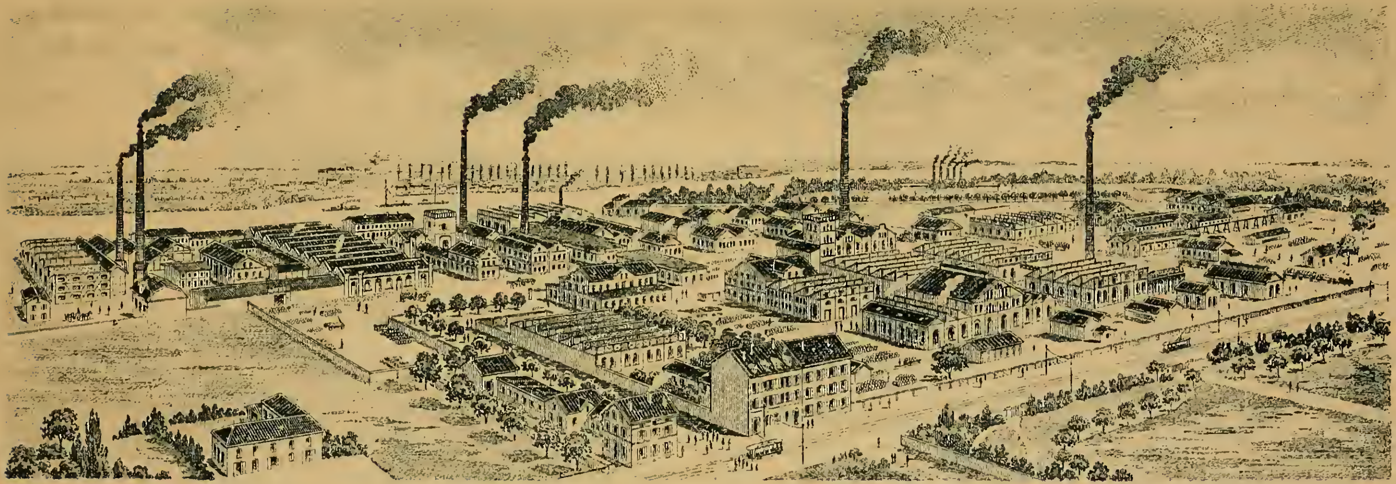

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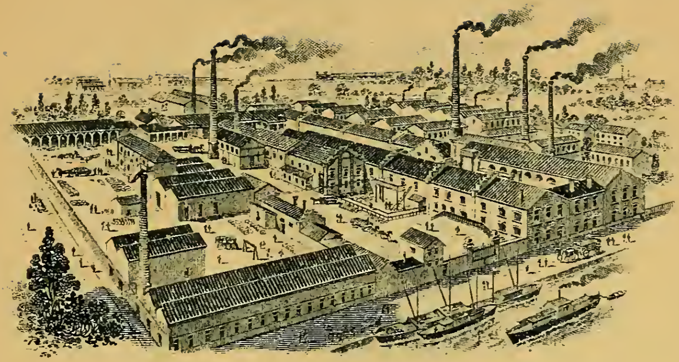

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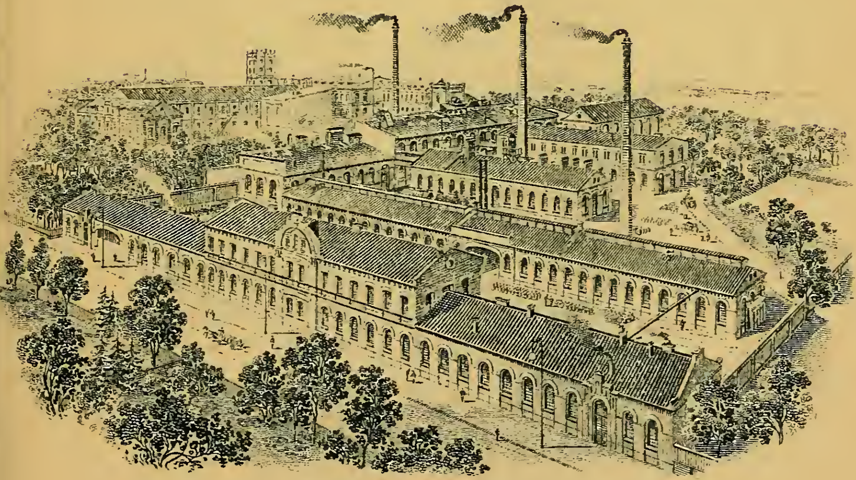

WORKS of the PABIANICE SOCIETY of Chemical Industry
in Pabianice (Russ. Poland).

# The Dyestuffs

OF THE

# Society of Chemical Industry

IN

# BASLE,

## and their Application.

OCTOBER, 1903.

Translated from the German Edition
BY
PERCIVAL J. WOOD,
Leeds, England.

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# PREFACE.

We have much pleasure in presenting our numerous customers with this brief compilation showing the properties and methods of application of our Dyestuffs in the various industries.

We shall always be glad to supplement it in any way with more complete information, pattern cards and samples of Dyestuffs.

Any practical suggestions which might serve to improve our little work will be thankfully received by us.

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# CONTENTS.

Those items printed in ordinary type refer to the text, those printed in *italics* refer to the tables.

PAGE
*CLASSIFICATION OF DYESTUFFS* - - 3
COTTON DYEING - - - - - - 7
DIRECT COTTON DYESTUFFS - - - 7
Dyeing in alkaline bath, with addition of Glauber's salt - - - - - 7
**Method No. 1** - - - - - 7
Dyeing in neutral bath, with addition of common salt - - - - - 8
**Method No. 2** . - - - - 8
Mode of dissolving the Direct Cotton Dyestuffs 8
Further use of old baths - - - - - - 8
Dyeing to shade - - - - - - 9
The dyeing of loose cotton - - - - 9
The dyeing of loose cotton, cops, cheeses, sliver, etc., in the different forms of mechanical apparatus - - - 9
Dyeing on the Jigger - - - - - 10
„ „ „ Padding-machine - - - 11
„ in the open vessel - - - - 12
„ „ „ open width continuous dyeing machine - - - - - - 12
„ in the cold - - - - - - 13
Topping with basic dyestuffs - - - - 13

PAGE

AFTER-TREATMENT OF THE DIRECT COTTON DYESTUFFS - - - 14

Diazotising and developing - - - - 14

**Method No. 3** - - - - - 14

Developing with soda - - - - - 16

After-treatment with metallic salts - - - 17

**Method No. 4** - - - - - 17

Increasing the fastness to water by after-treatment with alum and iron salts - - 17

After-treatment with diazotised Paranitraniline 19

**Method No. 5** - - - - - 19

*TABLE SHOWING THE PROPERTIES OF OF THE DIRECT COTTON DYESTUFFS* - - - - - 20-51

THE PYROGENE (SULPHUR) DYESTUFFS- 52

General method of application of the Pyrogene Dyestuffs - - - - - - 52

**Method No. 6** - - - - - 52

Mode of dissolving Pyrogene Dyestuffs - - 52

Addition of salt to the dyebath - - - 53

Dye-sticks, for the purpose of dyeing wholly or partially immersed - - - - 53

Further use of old baths - - - - - 53

Amount of salt contained in the bath - - 54

Topping with Basic Dyestuffs - - - - 54

Dyestuffs suitable for shading purposes - - 54

Avoidance of copper vessels - - - - 54

*LIST OF THE PYROGENE DYESTUFFS* - 55

PAGE

PYROGENE BLACK G, B, BD, GN, NB, GE, ON YARN AND LOOSE COTTON - 56

Wringing apparatus - - - - - - 56
After-treatment with metallic salts - - - 56
Application of the different brands of Pyrogene Black - - - - - - 57
Prevention of destruction of the fibre - - 58
Brightening after dyeing (Avivieren) - - 58
Dyeing of loose cotton, yarn and cops in the different forms of mechanical apparatus 58
Pyrogene Black on cotton warps - - - 59
Pyrogene Black in the Jigger - - - - 59
Squeezing arrangement for the Jigger - - 60
Further employment of old baths - - - 60
Dyeing of velveteen - - - - - 60
Dyeing with Pyrogene Black in the winch machine - - - - - - 61
,, with Pyrogene Black in the open width machine - - - - - - 61
,, with Pyrogene Black in the padding machine - - - - - - 62
Pyrogene Black in hosiery goods - - - 63

THIOPHENOL BLACK T extra, 2 B extra, 2 R extra - - - - - 64

PYROGENE BLUE R AND RR - - - 67

Oxidation by means of warm damp air - - 68
Developing by allowing to lie warm - - - 69
,, with Eau de Javelle - - - 70
Topping with Basic Dyestuffs - - - - 71
,, with Indigo - - - - - - 71

PAGE
Dyeing of cotton yarn and warps - - - - 72
,, in the different forms of mechanical apparatus - - - - - - - 73
Pyrogene Blue on piece goods - - - - 74
Dyeing on the Jigger - - - - - 74
,, ,, ,, padding machine - - - 75
,, ,, ,, open width machine - - - 76
PYROGENE DIRECT BLUE, RED SHADE AND GREEN SHADE - - - 77
Topping with Basic Dyestuffs and with Indigo - 78
PYROGENE BROWN G, 3 G, 5 G, B, D, M, V, R, AND PYROGENE CUTCH 2 G - - - - - - - 79
PYROGENE GREEN B AND PYROGENE OLIVE N - - - - - 80
PYROGENE GREY G, R, B - - - - 81
PYROGENE YELLOW M - - - - - 82
*PROPORTIONS OF THE DIFFERENT ADDITIONS TO THE BATH REQUIRED WHEN DYEING IN THE DIFFERENT FORMS OF MECHANICAL APPARATUS* - 84-85
BASIC DYESTUFFS ON COTTON - - - 86
**Method No. 7** - - - - - - 86
After-treatment with tannic acid - - - 87
Dyeing on Turkey red oil and alum mordant - 87
**Method No. 8** - - - - - - 87
**Method No. 9** - - - - - - 88

PAGE

TABLES SHEWING THE PROPERTIES OF THE BASIC DYESTUFFS - - 89-109

THE ACID DYESTUFFS ON COTTON - - 110

**Method No. 10** - - - - - 110

**Method No. 11** - - - - - 110

**Method No. 12** - - - - - 111

THE MORDANT DYESTUFFS ON COTTON - 112

**Method No. 13** - - - - - 112

*LIST OF DYESTUFFS FOR COTTON, Arranged according to Fastness and Method of Application* - - - - - 113

*Dyestuffs useful in apparatus-dyeing (particularly cops)* - - - - - 113

*Dyestuffs which are rendered fast to water by after-treatment with aluminium salts* - 114

*Dyestuffs useful for dyeing in the cold* - - 115

*Cotton dyestuffs fast to washing* - - - 116

„ „ *comparatively fast to washing* - 116

*Fastness to boiling size* - - - - . 117

*Cotton dyestuffs which withstand boiling in acid bath* - - - - - - 118

THE DYEING OF MERCERISED COTTON - 121

THE DYEING OF LINEN, HEMP AND RAMIE (CHINA-GRASS) - - 125

THE DYEING OF JUTE AND COCOANUT FIBRE - - - - - - 129

*Dyestuffs for Jute* - - - - - - 130

PAGE

WOOL DYEING - - - - - - - 133

DIRECT COTTON DYESTUFFS - - - 133

**Method No. 14** - - - - - 133

PYROGENE DYESTUFFS ON WOOL - - 134

BASIC DYESTUFFS ON WOOL - - - 135

**Method No. 15** - - - - - 135

The dyeing of light colours (stoved)- - - 136

**Method No. 16** - - - - - 136

ACID DYESTUFFS ON WOOL- - - - 137

**Method No. 17** - - - - - 137

**Method No. 18** - - - - - 138

FAST CLOTH BLUE B, BR, R, G - - - 139

**Method No. 19** - - - - - 139

*TABLES SHEWING THE PROPERTIES OF THE ACID DYESTUFFS* - 142-161

MORDANT DYESTUFFS ON WOOL - - 162

Dyeing on chrome mordant - - - - 162

**Method No. 20** - - - - - 162

Dyeing and after-chroming - - - - 163

**Method No. 21** - - - - - 163

*TABLES SHEWING THE PROPERTIES OF THE MORDANT DYESTUFFS* 164-167

*LIST OF DYESTUFFS FOR WOOL, Arranged according to their Fastness and Application* - - - - - - 168

*Dyestuffs which may be dissolved in hot acid bath* 168

*Dyestuffs for wool which dye easily level* - - 168

PAGE
*Dyestuffs fast to milling* - - - - - 169
" " *steaming* - - - - 171
" " *stoving* - - - - - 172
" " " *acids* . - - - - 173
" *for dyeing carpet yarn* - - - 174
" " " *shoddy* - - - - 175
*Dyestuffs fast to water* - - - - - 176
SILK DYEING - - - - - - - 179
Direct Cotton Dyestuffs on silk - - - 179
**Method No. 22** - - - - 179
Dyeing in bath containing Glauber's salt - - 179
" " " " boiled-off liquor - 180
Diazotising and developing - - - - 180
After-treatment with metallic salts - - - 181
PYROGENE DYESTUFFS ON SILK - - 181
ACID DYESTUFFS ON SILK - - - - 182
**Method No. 23** - - - - - 182
**Method No. 24** - - - - - 182
BASIC DYESTUFFS ON SILK. - - - 183
**Method No. 25** - - - - - 183
MORDANT DYESTUFFS ON SILK- - - 183
DYESTUFFS SOLUBLE IN OIL AND SPIRIT ON SILK - - - - - 184
THE DYEING OF WEIGHTED SILK - - 185
*LIST OF DYESTUFFS FOR SILK, Arranged according to their Fastness and Application* - - - - - - 186
*Dyestuffs intended specially for Silk Dyeing* - 186

PAGE

*Dyestuffs useful for Dyeing Silk Yarn, which is afterwards interwoven with raw silk and required to stand "boiling off" in the piece* - - - - - - 189

*Dyestuffs for heavily weighted silk* - - - 189

DYEING OF ARTIFICIAL SILK - - - 193

*Dyestuffs for Artificial Silk* - - - - 194

DYEING OF WOOL AND COTTON UNION GOODS - - - - - - 199

The One-bath Method for Union Goods - - 199

**Method 26** - - - - - - 199

The Two-bath Method for Union Goods - - 201

**Method 27** - - - - - - 201

Burl Dyeing - - - - - - - 202

*DYESTUFFS SUITABLE FOR UNION DYEING (HALF-WOOL)*- - - - - 203

*Direct Cotton Dyestuffs which dye the wool deeper than the cotton*- - - - 203

*Direct Cotton Dyestuffs which dye equally deep shades on wool and cotton* - - - 204

*Direct Cotton Dyestuffs which dye the cotton deeper than the wool* - - - - 205

*Acid Dyestuffs which dye the wool in neutral bath* - - - - - - - 205

*Direct Cotton Dyestuffs for Union Skirt Bindings* - - - - - - 206

*Dyestuffs for Union Felt Dyeing* - - - 207

THE DYEING OF HALF-SILK - - - 211

One-bath Method for Half-Silk - - - 212

PAGE

**Method No. 28** - - - - - 212

Two-bath Method for Half-Silk - - - 214

**Method No. 29** - - - - - 214

Pyrogene Dyestuffs on Half-Silk - - - 215

**Method No. 30** - - - - - 215

Pyrogene Dyestuffs on Wool, Half-Wool and Silk 216

*DYESTUFFS SUITABLE FOR DYEING HALF-SILK* - - - - - - 217

*Direct Cotton Dyestuffs which, in weakly alkaline bath, dye the cotton without dyeing the silk* - - - - - 217

*Direct Cotton Dyestuffs which dye the silk somewhat, but not so deep as the cotton* - 217

*Direct Cotton Dyestuffs which, in weakly alkaline bath, dye cotton and silk the same depth of shade* - - - - 217

*Dyestuffs suitable for Topping the Silk* - - 218

THE DYEING OF WOOL AND SILK UNION FABRICS (GLORIA) - - - 221

Direct Cotton Dyestuffs on Gloria - - - 221

**Method No. 31** - - - - - 221

Solid shades on Gloria - - - - - 221

**Method No. 32** - - - - - 221

Shot effects on Gloria - - - - - 222

**Method No. 33** - - - - - 222

*DYESTUFFS SUITABLE FOR DYEING GLORIA* - - - - - 223

PAGE

*Dyestuffs which gives shades equal in depth on wool and silk* - - - - - 223

*Dyestuffs which dye the silk lighter than the wool* 223

THE DYEING OF STRAW, STRAW PLAIT, WOOD, FURNITURE AND MATCHES - - - - - 227

*Dyestuffs for straw* - - - - - - 228

*Dyestuffs for staining wood* - - - - 229

THE DYEING OF IMITATION IVORY AND HORN BUTTONS, FEATHERS, AND EGGS - - - - - 233

LEATHER DYEING - - - - - - 237

THE DYEING OF BARK AND SUMAC-TANNED LEATHER - - - 237

THE DYEING OF CHROME LEATHER - 238

*DYESTUFFS SUITABLE FOR LEATHER* - 239

*Dyestuffs for bark-tanned leather* - - - 239

*Dyestuffs for chrome leather* - - - - 240

THE FUR DYESTUFFS AND THEIR APPLICATION IN FUR DYEING- - 243

PAPER DYEING AND THE MANUFACTURE OF INKS - - - - - 247

*DYESTUFFS SUITABLE FOR PAPER DYEING* - - - - - - 250

*Dyestuffs for blotting paper* - - - - 251

*Dyestuffs for mélange papers* - - - - 252

*Dyestuffs for paper staining (wall paper printing, &c.)* - - - - - - 253

PAGE

*DYESTUFFS FOR WRITING AND RULING INKS* - 254

THE PRODUCTION OF LAKES AND SHADING OF PIGMENT COLOURS - 257

Directions for Basic Dyestuffs - 257

„ „ Acid Dyestuffs - 257

„ „ Alkali and Pure Blue - 257

„ „ Resorcine Dyestuffs - 258

„ „ Direct Dyestuffs - 258

DYESTUFFS SOLUBLE IN SPIRIT AND OIL 261

THE DYEING OF SOAP - 261

*TABLE SHEWING THE SOLUBILITY OF Dyestuffs Soluble in Oil* - 262-265

*TABLE SHEWING THE SOLUBILITY OF Dyestuffs Soluble in Spirit* - 266

*DYESTUFFS FOR SOAP* - 267

*DYESTUFFS FOR SEALING WAX* - 267

THE PRINTING OF COTTON GOODS - 271

Printing with the Basic Dyestuffs - 271

„ „ Acid, Resorcine and allied Dyestuffs - 276

„ „ the Mordant (Chrome) Dyestuffs 277

Printing recipe for Gallocyanine Paste - 277

„ „ „ Alsace Blue G and O - 277

„ „ „ Black CN and C 20 - 278

Printing with the Pyrogene Dyestuffs - 278

PYROGENE DYESTUFFS IN HAND, PERROTINE, AND YARN PRINTING - 279

PAGE

PRINTING WITH DIRECT COTTON DYESTUFFS - - - - - - 280

Printing with Albumen or Caseïn - - - 280

*DYESTUFFS USEFUL FOR DIRECT PRINTING* - - - - - - 282

*Basic Dyestuffs* - - - - - - 282

*Dyestuffs fixed with chromium acetate* - - 283

*Acid Dyestuffs and allied colouring matter* - 283

*Pyrogene and Thiophenol Dyestuffs* - - - 283

*Direct Cotton Dyestuffs* - - - - - 284

DISCHARGE AND RESIST-PRINTING ON COTTON PIECE GOODS - - 285

Dyeing on tannin prepared cotton with a caustic soda discharge - - - - - - 285

Caustic soda discharge - - - - 286

Caustic soda discharge on dyed goods - - 286

*DYESTUFFS SUITABLE FOR DYEING Tannin Prepared Cotton Printed with Caustic Soda Discharge* - - 287

DISCHARGING WITH POTASSIUM SULPHITE - - - - - - 288

Stock discharge - - - - - - 288

Coloured discharge - - - - - - 288

*DYESTUFFS SUITABLE FOR DISCHARGing with Potassium Sulphite* - - 289

*Dischargeable Dyestuffs* - - - - - 289

*Basic Dyestuffs for coloured discharges* - - 289

*Direct Dyestuffs for coloured discharges* - - 289

Antimony Resist - - - - - - 290

PAGE

OXIDATION DISCHARGE - - - - 291
- Discharge for white - - - - - - 291
- Stock discharge - - - - - - 291
- Discharge - - - - - - - 292
- Coloured discharge for Alizarin Dyestuffs - 292
- Coloured discharge for Indigo - - - - 293
- Ferroprussiate of tin paste - - - - 293
- Padding recipe for Gallocyanine - - - 293

*DYESTUFFS SUITABLE FOR THE OXIDATION DISCHARGE* - - - 294
- *Dischargeable Basic Dyestuffs* - - - - 294
- *Direct Dyestuffs which withstand oxidation* - 294

DISCHARGING THE PYROGENE DYESTUFFS - - - - - - 295
- Discharge for white - - - - - - 296

DISCHARGING THE DIRECT COTTON DYESTUFFS - - - - - - 298
- Zinc dust discharge - - - - - - 298
- Acetin discharge - - - - - - 299
- Coloured discharges on Direct Cotton Dyestuffs 300

*DYESTUFFS SUITABLE FOR DISCHARGing with Tin Crystals and Zinc Dust* - 301
- *Dischargeable Direct Cotton Dyestuffs* - - 301
- *Basic Dyestuffs for coloured discharges* - - 302

WHITE DISCHARGES ON GALLOCYANINE GROUND - - - - - 303
- Discharge - - - - - - - 303

PAGE
COLOURED RESISTS UNDER ANILINE BLACK - - - - - - 304
Aniline Black preparation - - - - 304
Discharge with Basic Dyestuffs - - - 304
Discharge with Direct Dyestuffs - - - 305
*DYESTUFFS SUITABLE FOR USE WITH Aniline Black Discharges* - - - 306
*Basic Dyestuffs* - - - - - - 306
*Direct Cotton Dyestuffs* . - . - - 306
RESISTS UNDER PARANITRANILINE RED 307
MERCERISED EFFECTS - - - - - 308
CREPONNE EFFECTS - - - - - 308
Resist with Albumen - - - - - 309
Resist with Acetate of Chrome - - - 309
THE PADDING OF PRINTED GOODS DURING THE FINISHING OPERATION - - - - - 310
*DIRECT COTTON DYESTUFFS USEFUL for Padding after Printing* - - 311
THE PRINTING OF COTTON YARN - - 312
Usual recipe for colour printing - - - 313
Caustic soda discharge for white - - - 313
Coloured discharges- - - - - - 313
Printing with Pyrogene colours on cotton yarn- 314
JUTE PRINTING - - - - - - 317
WOOL PRINTING - - - - - - 321

PAGE

PRINTING ON WOOLLEN PIECE GOODS - 321
Chloring of the wool - - - - - 321
The tin preparation - - - - - 321
Preparation of the printing pastes - - - 322
Usual recipe for wool printing - - - - 323
Hand printing - - - - - - 324
Printing recipe for Cochineal Substitute - - 324
Printing recipe for Acid Black - - - - 325

*DYESTUFFS SUITABLE FOR DIRECT Printing of Wool* - - - - 326
*Basic Dyestuffs* - - - - - - 326
*Acid Dyestuffs* - - - - - - 326
*Direct Cotton Dyestuffs* - - - - - 327

DISCHARGE EFFECTS ON WOOLLEN PIECE GOODS - - - - - - 328
Stock discharge - - - - - - 328
Coloured discharge - - - - - - 329

*DYESTUFFS SUITABLE FOR THE PRODUCTION of Discharge Effects on Wool and Silk* - - - - - - 330
*Dyestuffs dischargeable with tin crystals and zinc dust* - - - - - - - 330
*Dyestuffs suitable for the production of coloured discharges with tin crystals and zinc dust* - 332

WOOLLEN YARN PRINTING - - - - 333
Chloring of the yarn - - - - - 333

THE PRINTING OF WOOL PLUSH, IMITATION SKINS AND FLAG MATERIALS - 335

PAGE
SLUBBING PRINTING (VIGOREUX) - - 336
SILK PRINTING - - - - - - 341
PRINTING OF SILK PIECE GOODS - - 341
Usual recipe for silk printing - - - - 342
WHITE AND COLOURED DISCHARGE EFFECTS ON SILK PIECE GOODS 343
Tin discharge for silk - - - - - 344
Gum mastic resist - - - - - - 344
PRINTING OF SILK YARN AND WARPS (CHINÉ) - - - - - - 346
DISCHARGE EFFECTS ON SILK YARN - 346
PRINTING OF HALF-WOOL GOODS - - 351
Printing with Direct Cotton Dyestuffs - - 351
Coloured discharge with Tin Crystals - - 352
Coloured discharge with Zinc Dust - - - 352
PRINTING AND DISCHARGING OF HALF-SILK - - - - - - 357
PRINTING AND DISCHARGING OF GLORIA 361

---

APPENDIX.

PYROGENE INDIGO - - - - - - 365
Dyeing recipe for Pyrogene Indigo - - - 366
*TABLE FOR CONVERTING DEGREES Centigrade (Celsius) into Degrees Fahrenheit* - - - - - 368
*COMPARATIVE TABLE OF HYDROMETER Degrees Beaume and Twaddle* - - 369

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ALPHABETICAL INDEX.

# Classification of the Dyestuffs.

ACCORDING to their Properties and Method of Application, our Dyestuffs may be divided into the following Groups :—

## Classification of the Dyestuffs.

(*a*) Direct Cotton (Substantive) Dyestuffs.
(*b*) Pyrogene (Sulphur) Dyestuffs.
(*c*) Basic Dyestuffs.
(*d*) Acid and Eosine (Resorcine) Dyestuffs.
(*e*) Mordant (Chrome) Dyestuffs.
(*f*) Dyestuffs insoluble in water (soluble in oil and spirit).

# Cotton Dyeing.

# Cotton Dyeing.

## The Direct Cotton Dyestuffs.

### Dyeing in Alkaline Bath containing Glauber's Salt.

**Method No. 1.** Usual recipe for Direct Cotton Dyestuffs on Cotton :—

| | | |
|---|---|---|
| 100 | lbs. | Cotton. |
| 200—250 | gallons | Water (20—25 times the weight of the goods). |
| 4—20 | ozs. | Solvay Soda. |
| 20—75 | lbs. | Cryst. Glauber's Salt. |

The goods are entered at 40—50° C. (100—120° F.), raised to the boil, and dyed boiling for one hour, washed and dried. In place of Solvay soda, calcined soda may be used, or double the quantity of crystal soda ; similarly, the crystallised Glauber's salt may be replaced by half the quantity of calcined Glauber's salt. Besides soda other alkalies are also used, particularly for pale and bright shades, the amounts required being as follows :—

| | | | |
|---|---|---|---|
| $\frac{1}{4}$—$\frac{1}{2}$ | oz. | Soap. | Per Gallon of Dye Liquor. |
| $\frac{1}{4}$—$\frac{5}{6}$ | oz. | Waterglass (Silicate of Soda). | |
| $\frac{1}{4}$—$\frac{5}{6}$ | oz. | Phosphate of Soda. | |
| $\frac{1}{4}$—$\frac{5}{6}$ | oz. | Borax. | |

The quantity of Glauber's salt varies according to the solubility (levelling properties) and quantity of the dyestuff ; dyestuffs which are easily soluble (level dyeing) require greater additions of Glauber's salt, those less easily soluble (good exhausting) require smaller additions of Glauber's salt.

## Dyeing in Neutral Bath containing Common Salt.

Many dyestuffs, *e.g.*, most of our Chlorantine dyestuffs, give deeper shades in neutral than in alkaline bath, but they can also be applied in the latter, especially in mixtures ; in this case the use of common salt has been found to be more advantageous than the employment of Glauber's salt.

With such dyestuffs the mode of procedure is as follows :—

### Method No. 2.

| | | |
|---|---|---|
| 100 | lbs. | Cotton. |
| 200—250 | gallons | Water. |
| 30—75 | lbs. | Common Salt. |

Dye one hour boiling, wash and dry.

Instead of common salt, rock salt may be employed without danger of spoiling the shade.

## Mode of Dissolving the Direct Cotton Dyestuffs.

The direct cotton dyestuffs are best dissolved in hot condensed water, the solution being passed into the dyebath through a fine sieve. Hard water should be corrected by a slight addition of soda.

## The Use of Old Baths.

As most of the direct cotton dyestuffs do not entirely exhaust, the old dye liquors may be used for further operations, after replenishing with small quantities of dyestuffs. The additions of soda (alkali) and Glauber's salt are reckoned on the amount of water required to bring up the dyebath to the original volume.

## Dyeing to Shade.

Shading, that is the after addition of dyestuff during the dyeing operation, requires a certain amount of care. The dyebath should be cooled somewhat before making any addition ; this precaution is particularly important when using dyestuffs which do not easily dye level ; in the case of level dyeing colours it is of lesser importance.

The foregoing recipes hold good in all ordinary dyeing operations, also for the dyeing of piece goods on the jigger, padding machine, winch machine and open width machine ; for loose cotton, for the dyeing of cops, cheeses and sliver in the different forms of apparatus. It is necessary, however, in using the different machines, to take into consideration the volume of the dye liquor, the duration of the operation, and various other circumstances, so we will now endeavour to indicate the most important points to be observed.

## The Dyeing of Loose Cotton.

Loose cotton is dyed in kettles according to the same recipes as yarn ; if the goods are required to be dyed perfectly even, the dyestuff, as well as the Glauber's salt, is added in several portions to the dyebath from time to time.

The diazotising and developing operations follow, in which the cotton in nets is plunged into the various baths and well worked about.

## The Dyeing of Loose Cotton, Cops, Cheeses, Sliver, etc., in the various forms of Mechanical Apparatus

Is carried out in a similar manner, but generally, varying with the form of apparatus employed, the bath is more concentrated.

Dyestuffs for apparatus dyeing must be easily soluble and possess good levelling properties ; most of our dyestuffs have these good qualities, and are therefore suitable for apparatus dyeing.

Whenever possible condensed water should be used ; hard water should first be corrected with soda.

An addition of 1—3 pints of turkey red oil per 100 gallons of dye liquor ensures thorough wetting out and penetration of the goods. The goods are entered into the luke-warm bath containing only part of the necessary amount of dyestuff and soda, and worked for some time, then the rest of the dyestuff and soda and the requisite quantity of common salt is added from time to time, while the temperature of the bath is gradually raised to the boiling point. The boiling is continued for some time.

The additions are reckoned according to the depth of shade required, and consist of—

½—3 % Soap.
or, 0—2 ,, Soap (sometimes 3—5 % sodium phosphate).
4—12 ,, Glauber's salt.

Pale shades exhaust almost completely.

In the dyeing of pale shades on cops, the goods are entered cold, and dyed for ¼ hour at 40—50° C. (100—120° F.). Very pale shades (tints) are dyed cold without further addition.

## Dyeing on the Jigger.

Goods are generally dyed on the jigger in very conconcentrated bath.

The bath is prepared with—

¼—½ oz. Soda. } Per Gallon
or, ¼—½ oz. Soap. } of Dye Liquor.

Together with half the requisite quantity of dyestuff. The goods are given one "end" at a temperature of 60—90° C. (thick goods require a higher temperature than thinner goods), and the rest of dyestuff added in several portions, part being added before each "end" through the liquor. Towards the conclusion of the operation ⅓—3 ozs. Glauber's salt per gallon (according to the depth of the shade) is added to the bath in one or more portions, and the goods given several "ends" in the boiling bath until the required shade is obtained.

In the case of goods which are difficult to penetrate an addition of 1½—3 pints of turkey red oil per 100 gallons of dye liquor is recommended; these dyestuffs applied according to Method No. 2 without alkali, may also be dyed with addition of turkey red oil.

For dark shades the old baths may be used for further quantities of goods, ⅔—⅘ of the original quantity of dyestuff, and ⅓ of the other additions, being required to replenish the bath.

## Dyeing on the Padding Machine.

The padding machine is used principally in dyeing thin goods, particularly for linings. In this machine also, goods are dyed in a concentrated bath in 3—6 ends.

The pad trough contains 15—20 gallons of dye liquor, and is heated by means of a steam pipe, for pale shades to a temperature of 50—60° C. (120—140° F.), for dark shades to 70—90° C. (160—195° F.). Padding machines with three rollers are more suitable than those with only two squeezing rollers, although the latter may also be used.

The mode of procedure is as follows:—

For a roll of goods about 70—80 lbs.

| | | |
|---|---|---|
| 15 —20 | gallons | Water. |
| 4 — 4½ | ozs. | Soda. |
| ⅕— ⅓ | pint | Turkey Red Oil. |
| 5 —20 | ozs. | Dyestuff (½—1½ %). |
| 6½—23 | ozs. | Calcined Glauber's Salt. |
| 0 —20 | ozs. | Dextrine. |

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The trough is charged with part of the dye solution, soda and turkey red oil, and the goods taken one "end" through the machine. The rest of the dye-solution and the Glauber's salt is added in several portions before each "end." After three or four "ends" the goods are sampled and the necessary amount of dyestuff still required is added.

Padding with addition of dextrine is recommended, especially for pale shades on cotton linings; the goods are passed once or twice through the machine. Instead of soda, $\frac{1}{10}$—$\frac{1}{6}$ oz. phosphate of soda, borax or soap is used; in this case the addition of Glauber's salt and the subsequent washing are omitted.

## Dyeing on the Winch Machine.

This method is mostly employed for strong and broad goods, and yields shades a trace brighter than those obtained on the jigger; the goods are dyed with the addition of—

2—6 % Soda. } On the Weight
10—20 ,, Glauber's Salt. } of the Goods.
or,
10—15 ,, Phosphate of Soda or Borax.
1—3 ,, Soap.
or for those dyestuffs which are dyed
by Method No. 2 with
20—35 % Common Salt.

Also in cases where otherwise no soda would be used, hard water must be corrected by a slight addition of soda.

## Dyeing on the Open-width (Continuous) Machine.

For the production of large quantities of black or dark-blue coloured goods this method is frequently employed, and is often followed by the operations of diazotising and developing. (*See Method No. 3.*)

The machine consists of a series of boxes (two or three) which contain the dye liquor, provided with guide rollers and steam pipes, and over the dividing partitions between the boxes are placed squeezing rollers ; following these are several boxes fitted with spirt pipes for the purpose of washing the goods.

## Dyeing in the Cold.

Many dyestuffs, especially those which exhaust with difficulty, dye almost as well in a warm bath (35—50° C.) as in a hot bath, and this property is made use of in certain branches of the dyeing industry ; the dyeings obtained in this manner, however, are somewhat less fast to washing than those obtained at a higher temperature.

## Topping with Basic Dyestuffs.

The direct cotton colours possess an appreciable affinity for the basic dyestuffs, and in cases where it is required to improve a shade, a topping with basic dyestuffs is recommended.

The topping with basic dyestuffs (in quantities from 0·1—0·5 %) is conducted, after washing the goods, in a fresh bath, which should be neutral or slightly acidulated with acetic acid.

The addition of acetic acid corrects any chalk contained in the water.

The goods are entered cold, and warmed slowly up to 40—50° C.

# After-treatment of the Direct Cotton Dyestuffs.

By various methods of treatment after dyeing, certain of the direct cotton dyestuffs acquire superior properties with regard to beauty of shade, fastness to light, washing, etc. The principal methods of after-treatment are—

Diazotising and developing.

After-treatment with metallic salts. (Copper sulphate, bichromate of potash, chrome alum, etc.)

After-treatment with diazo-compounds.

## Diazotising and Developing.

### Method No. 3.

Goods dyed according to Method No. 1 are treated for about ¼ hour in a cold bath containing—

| | | |
|---|---|---|
| 1½—2 lbs. | Nitrite of Soda. | Per 100 Gallons of Water |
| 4—5 pints | Hydrochloric Acid, 35° Tw., or, | |
| 2½—3½ pints | Sulphuric Acid, 168° Tw. | |

Wash in water slightly acidified with hydrochloric acid, and develop immediately after with one of the developers mentioned in the following list.

The diazotised goods should not be exposed to the action of light any longer than absolutely necessary.

The diazotising bath may be used for further batches of goods, ⅓ of the above quantities being sufficient to replenish the bath.

As developers the following compounds are found useful :—

α-Naphthol,
β-Naphthol,
Toluylene Diamine,
Resorcine,
Phenol.

For 100 lbs. cotton the bath is prepared as follows :—

250 gallons cold water.

| | | |
|---|---|---|
| 1 —1½ | lbs. | β-Naphthol. |
| ¾—1¼ | lbs. | Caustic Soda, 75° Tw. |
| | | or, |
| ¾—1 | lb. | Toluylene Diamine. |
| 1 —2 | lbs. | Soda. |
| | | or, |
| ½— ¾ | lb. | Resorcine. |
| 1¼—1½ | lbs. | Caustic Soda, 75° Tw. |

Hot water is poured on to the developer, and caustic soda (or soda) and the solution added to the cold bath.

α-Naphthol is dissolved in the same way as β-Naphthol, Phenol in the same way as Resorcine, Toluylene Diamine is soluble without addition of caustic soda.

The developing baths may be used for subsequent operations (say six or seven times), and renewed with ¾ of the original amounts.

The diazotised and developed dyeings yield deeper shades, and colours of greater beauty than those undeveloped, the shades produced being also fast to washing and generally fast to milling. The fastness to storing is excellent.

The dyeings so obtained may be topped with small quantities of basic dyestuffs in order to improve the shade. Sometimes the topping dyestuff, generally Methylene Blue G, is added direct to the developing bath.

## Developing with Soda.

Our Direct Brown M, which is usually developed with Toluylene Diamine, may also be developed with soda alone. After diazotising, the goods are treated in a bath with 1—2 % soda (reckoned on the weight of the goods). The dyeings obtained by this method, however, are not so deep as those produced by means of Toluylene Diamine.

## After-treatment with Metallic Salts.

By after-treating dyeings obtained in the usual manner with copper or chrome salts (or a mixture of both), the fastness of many dyestuffs is considerably increased; copper salts generally increasing the fastness to light, whereas chrome salts increase the fastness to washing.

### Method No. 4.

Goods dyed according to Method No. 1 are treated for ¼—½ half hour at a temperature of 80—90° C. (176—194° F.) with—

3—4 % Copper Sulphate, or
3—4 ,, Bichromate of potash or soda, or
1—3 ,, Chromium Fluoride, or
2—4 ,, Chrome Alum.

After-treatment with copper sulphate is generally more suitable for blue shades, after-treatment with chrome salts being usually employed for brown shades.

The different brands of Cupranil Brown form a notable exception to this rule, being rendered much faster to washing by an after-treatment with copper salts.

The fastness to light of diazotised and developed dyeings may be increased by an after-treatment with copper sulphate or chrome alum.

## Increasing the Fastness to Water by Treating with Aluminium and Iron Salts.

By after-treatment of many direct dyestuffs with aluminium or iron salts, an increased fastness to washing is obtained.

For this purpose the goods are treated for ½ hour cold in a bath containing—

3—4 % Aluminium Acetate, 12° Tw., or
{ ½ ,, Aluminium Sulphate and
{ ½ ,, Sodium Acetate, or
{ ½ ,, Aluminium Sulphate and
{ ¼ ,, Soda, or
2—3 ,, Acetate of Iron, 15° Tw.

After-treatment with iron salts renders the shades somewhat duller.

## After-treatment with Diazotised Paranitraniline.

Some dyestuffs, particularly our Nitranil Browns and Carbide Black E, give considerably fuller and deeper shades, possessing good fastness to washing and acids, when after-treated with paranitraniline.

DIAZO SOLUTION.

6½ lbs. *p*Nitraniline
3½ lbs. Nitrite of Soda
are mixed into a paste with
½ gallon boiling water, and poured into
2 gallons cold water, containing a little ice.

The above solution is added slowly, with constant stirring, to

1¼ gallons Hydrochloric Acid, 35° Tw.
1 gallon Water.
10 lbs. Ice.

and the mixture made up to 50 gallons with cold water.

This solution keeps good several days if stored in a cold place, away from the action of the light.

## Developing with Diazo Paranitraniline.

### Method No. 5.

The goods, dyed according to Method No. 1, are washed well and worked for half an hour cold in the following bath :—

For 100 lbs. of Cotton.
200—250 gallons cold water.
7—8 gallons Diazo Solution.
2—2½ lbs. Acetate of Soda.

The goods are afterwards washed. An addition of ¼—10 ozs. copper sulphate to the diazo bath increases the fastness to light.

## Direct Cot

| NAME OF DYESTUFF. | Dye according to | After-treatment. | FASTNES | | |
|---|---|---|---|---|---|
| | | | Light. ❊ | Washing. | Ac |
| **THIAZOL YELLOW 2192** | Method No 1. | | III—IV. | Not good. Bleeds a little into white cotton | Mod 50 % acid the s ora |
| **CHLORANTINE YELLOW J J**<br>**" " J G**<br>**FAST YELLOW R 1209** | Method No. 2. (May also be applied in alkaline bath). | | I—II. | In light and dark shades good. | Very 50 % acid not al sh |
| **COTTON YELLOW C H** | Method No. 1. | | II. | Not particularly good. Bleeds into white cotton | Very With the of mi a |

❊ Dyestuffs possessing the greatest fastness to light are mark

# stuffs.

| WARDS | | | Discharge-ability. | Other Properties. Remarks. |
|---|---|---|---|---|
| ies. | Chlorine. | Ironing. | | |
| ood. | Not good. | Very good. | With zinc dust good. With tin crystals not good. | Although the fastness to light of Thiazol Yellow is not nearly so good as that of Chlorantine Yellow J J, it is much used for sulphur-yellow shades on account of its bright greenish tone. The dyestuff is easily soluble, and exhausts well. In dyeing light shades the baths are exhausted, in dark shades about ⅓ of the dyestuff remains in the bath. This colour is sensitive to copper. |
| d. | Very good Not altered by 3—4 hours' immersion in bleaching powder solution, 3° Tw. | Good. | Do not give a pure white with either zinc dust or tin crystals. | Much used on account of their solubility and fastness to light, for cotton yarn and piece goods, also for padding goods for printing. In consequence of their fastness to Chlorine, they may be used for coloured discharges on indigo, basic and alizarin dyestuffs, when the chlorate or oxidation discharge is employed. In alkaline bath these dyestuffs dye only the cotton in half-silk, leaving the silk perfectly white. The colours are not sensitive to copper. |
| d. | Good. | Very good. | With zinc dust and with tin crystals good. Best yellow for discharging | Much employed in cotton dyeing on account of its superior covering power. Universally used in wool, half-wool, and half-silk dyeing. Suitable for "creaming" curtains and goods for calico printing and oxidation discharging. Copper renders the shade somewhat redder. |

se marked IV are comparatively the poorest in this respect.

## Direct Cot

| NAME OF DYESTUFF. | Dye according to | After-treatment. | FASTNES | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | Ac |
| **DIRECT YELLOW C R 1746** | Method No. 1. Addition of phosphate of soda gives richer and greener shades. | Method No. 4. 2% copper sulphate<br>2% bichromate of potash<br>gives greenish shades faster to washing. | I. | As Cotton Yellow C H. | Very St acid the green the o sh retu was |
| **DIRECT YELLOW T** | Method No. 2 (may also be applied in alkaline bath). | | I—II. | In light shades good. Bleeds a little into white. | Very Not by acet |
| **DIRECT ORANGE G R (KANTHOSINE)** | Method No. 1. | Method No. 4. Direct Orange R treated as per Method No. 5 gives a brown fast to washing. | II—III. | In pale shades good. By after-treatment very good. | I Or by ace ye but c ret wa I Or is t this |

## stuffs.

| WARDS | | | Discharge-ability. | Other Properties. Remarks. |
|---|---|---|---|---|
| ies. | Chlorine. | Ironing. | | |
| le nes but ginal ur s on ng. | Colour is destroyed. | Good. Becomes redder, but original colour returns on cooling. | Good, less easily dischargeable than Cotton Yellow C H. | Much employed on account of its fastness to light. Is rather sensitive to copper. It is used for padding purposes.<br>Direct Yellow C R 1746 dyes solid shades on half-silk, and gives shades on wool which are fast to milling. |
| d. | Very good. | Good. Becomes redder, but original colour returns on cooling. | Not dischargeable. | Very similar in its properties to Chlorantine Yellow, and is employed for the same purposes. |
| d. | Colour is destroyed. | Good. | With zinc dust good. With tin crystals fairly good. Gives a good white. | Generally used, on account of their solubility and good levelling powers, for mixtures, and in apparatus dyeing. Suitable for half-wool dyeing, giving solid shades.<br>These dyestuffs are somewhat affected by copper and tin. |

## Direct Cot

| NAME OF DYESTUFF. | Dye according to | After-treatment. | FASTNES | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | Ac |
| **CHLORANTINE ORANGE T R**<br>„ „ **T R R** | Method No. 2. (In mixtures also with alkali.) | | II—III. | Better than Direct Orange G. & R. | Go With the a of 5 acetic 1 sulph ac rende sh some darke the or col retur wasl |
| **CHLORANTINE BROWN R**<br>„ „ **B**<br>„ „ **B B** | Method No. 2. (In mixtures with alkali). | | I—II. The R brand is particularly fast to light. | Good. Fairly dark shades scarcely stain white cotton. | Go With the a of 5 acetic |
| **DIRECT BROWN R 1804** | Method No. 1. | Method No. 4. The shade is darkened by copper. | II. After-treated with copper. I. | Moderate. In dark shades bleeds into white cotton. After treated with copper good. | Very With actic 50 % acic 10 sulp ac |

## stuffs.

| WARDS | | | Discharge-ability. | Other Properties. Remarks. |
|---|---|---|---|---|
| s. | Chlorine. | Ironing. | | |
| . | Very good. | Good. T R R becomes somewhat yellower, but the original colour returns on cooling. | Does not give a pure white with either zinc dust or tin crystals. | Easy to dissolve and dye very level. In the dyeing of half-silk the silk is left white. Suitable for cotton dyeing, particularly for apparatus dyeing, oxidation discharging and "creaming" of curtains and printed goods.<br>Not sensitive to copper, but somewhat affected by tin. |
| | Very good. | Good. | As Chlorantine Orange. | The Chlorantine Browns, particularly R, belong to the fastest existing browns against the action of light, and on this account as well as for their fastness to washing, are much in demand for warp and yarn dyeing. They are suitable for apparatus dyeing, being readily soluble and possessing good levelling powers. In half-silk dyeing the silk is somewhat dyed. The shades produced on silk are fast to water.<br>Not affected by copper, slightly by tin. |
| od. | Colour destroyed. | Becomes yellower, on cooling the shade returns. | With zinc dust good. With tin crystals fairly good. Gives a good white. | Levels well and exhausts. Much used, particularly in mixtures with other dyestuffs capable of being treated with copper. Dyes half-wool solid, silk in half-silk somewhat yellower. Applicable in wool dyeing. |

## Direct Co

| NAME OF DYESTUFF. | Dye according to | After-treatment. | FASTNE | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | A |
| **DIRECT BROWN J P** | Method No. 1. | | II—III. | As Direct Brown R 1804. | 50 % acid the som da Wa brin the sh |
| **CUPRANIL BROWN G 2661**<br>**R 2660**<br>**B 2659** | Method No. 1. | Methods 3 & 4. In the case of G & R after-treatment with 1—2 % copper sulphate followed by soaping is recommended for increasing fastness to washing. | II—III. After-treated with copper. I. | Fairly good. If after-treated with copper very good. Withstands alkaline soap bath without bleeding into white. | With the of ace an sul |
| **DIRECT BROWN M 617** | Method No. 1 or Method No. 2. | Methods 3 & 4. Diazotised and developed with Toluylene Diamine. Generally also after-treated with {1 % copper sulphate, 1 % bichrome} ½ hour at 70—80° C. | II—III. Diazotised and developed II. after treatment with copper sulphate and bichrome I. | Fairly good. Dyeings treated with copper are fast to washing and milling. Developed dyeings are also fast to washing. | 50 aci the so r de co littl |

## stuffs.

| VARDS | | | Discharge-ability. | Other Properties. Remarks. |
|---|---|---|---|---|
| es. | Chlorine. | Ironing. | | |
| . | Colour destroyed. | Good. | With zinc dust good, with tin crystals not dischargeable. Used for coloured discharges. | Dyes easily level. Much used for dyeing hosiery and knitting yarn. |
| . | Colour destroyed. | Good. B is turned redder, but the shade returns on cooling. | B Very good. G & R not so good. | Particularly useful for dyeing yarns for coloured woven goods, also for loose cotton. Of interest also in the hosiery and knitting yarn trade on account of their good penetrating powers. In consequence of their solubility and level dyeing properties much in demand for apparatus dyeing (cops). The B brand is used in the production of discharge effects. In half-wool dyeing the cotton is dyed darker than the wool; by continued boiling the dyestuff is attracted more and more by the wool. |
| . | Colour destroyed. | Turned slightly redder. | Gives a good white with zinc dust. Tin crystals only useful for coloured discharges. | The diazotised and developed dyeings are decidedly darker and fuller, and on account of their cheapness, much employed.<br>Direct Brown M dyes easily level and exhausts well, is suitable for shading other dyestuffs, and when after-treated with copper and chrome serves as a substitute for catechu. It dyes the wool in half-wool paler and redder than the cotton. |

## Direct Co

| NAME OF DYESTUFF. | Dye according to | After-treatment. | FASTNE | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | A |
| **Nitranil Brown O**<br>**R D**<br>**G**<br>**B D**<br>**B**<br>**B B** | Method No. 1. | Method No. 5. The stable diazo-compounds, such as Nitrazol, Azophor red, Nitrosamine can also be used. By addition of 3 to 5 % copper sulphate to the diazo bath, the fastness to light is increased. | II—III. | After-treated dyeings very good; does not bleed into white when treated with alkaline soap at 50° C. | A<br>tr<br>dyei<br>g |
| **Direct Brown 673**<br>**703** | Method No. 1 or Method No. 2. | Method No. 3 Method No. 4. Diazotise and develop with Toluylene Diamine or aftertreat with 1—2 % copper sulphate 1—2 % bichrome | II—III. Developed with Toluylene Diamine not so good as M 673, with copper and bichrome very good. | In pale shades good, developed or after-treated very good. | As<br>B<br>M |
| **Direct Brown V 1737** | Method No. 1. | Method No. 3. Diazotise and develop with Toluylene Diamine or with soda. | II—III. | Good. White scarcely stained. Diazotised and developed dyeings very good. | 50<br>acid<br>the<br>mor<br>b<br>o<br>s<br>ret<br>w |

# tuffs.

| ARDS. | | | Discharge-ability. | Other Properties. Remarks. |
|---|---|---|---|---|
| s. | Chlorine. | Ironing. | | |
| od. | Colour destroyed. | Very good. | Good with zinc dust, poor with tin crystals. | After-treated with paranitraniline gives shades from reddish to darkest brown of good fastness to washing. Suitable for all purposes in cotton dyeing, also for apparatus dyeing. |
| | Colour destroyed. | As Direct Brown M 673. | As Direct Brown M 673. | The diazotised and developed dyeings are fuller and deeper than Direct Brown M 617. |
| | Colour destroyed. | Considerably altered. The original shade returns on cooling. | As Direct Brown M 673. | Exhausts well, and gives very dark shades of good fastness to washing. By developing with Toluylene Diamine still darker and fuller shades are produced. Development with soda gives shades not quite so deep. |

## Direct Co

| NAME OF DYESTUFF | Dye according to | After-treatment. | FASTNE | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | A. |
| **COTTON RED C** | Method No. 1. | | III—IV. | Not good. | No<br>is bl<br>by c<br>aci<br>atm<br>It i<br>able<br>for<br>the<br>wat<br>be a |
| **COTTON RED D** | Method No. 1. | | III. | Poor on cotton, on wool fast to washing, and fairly fast to milling. | C |
| **COTTON RED B** | Method No. 1. | | III. Better than Cotton Red C, but not so good as Cotton red D. | On cotton poor, on wool good. | Fai<br>wit<br>10 |
| **COTTON RED 4 B**<br>**6 B** | Method No. 1. | | III. | On cotton poor, on wool good. | Bet<br>C<br>R<br>bu<br>g<br>C<br>R |

# tuffs.

| VARDS | | | Discharge-ability. | Other Properties.<br>Remarks. |
|---|---|---|---|---|
| s. | Chlorine. | Ironing. | | |
| | Colour destroyed. | Very good. | Good both with zinc dust and tin crystals. | Used in large quantities for cotton dyeing. |
| | Colour destroyed. | Very good. | Good both with zinc dust and tin crystals. | This dyestuff is easily soluble, and has good levelling powers, fairly fast to acids on cotton.<br>Suitable for wool dyeing on account of its fastness to milling and stoving. At 80°—90° C. dyes half-wool and half-silk fairly solid; on long boiling the wool is dyed deeper.<br>Is not sensitive to copper. |
| | Colour destroyed. | Good, becomes a trace yellower. | Good with zinc dust and tin crystals. | Is one of the Cotton Reds faster to air and acids; is very useful for producing yellower reds on cotton. Suitable also for wool, half-wool and half-silk. In half-wool the wool is dyed somewhat deeper.<br>Not sensitive to copper. |
| | Colour destroyed. | Good, somewhat more affected than Cotton Red B. | Good with zinc dust and tin crystals. | Properties and application as Cotton Red B.<br>Cotton red 4 B is the brand most used for Turkey red shades on cotton.<br>The silk in half-silk is dyed somewhat yellower.<br>Not affected by copper. |

## Direct Co

| NAME OF DYESTUFF. | Dye according to | After-treatment. | FASTNE | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | A |
| **ACID CONGO R 1573** | Method No. 1. | | III.<br>Better than Cotton Red C. | As above.<br>On wool fairly fast to milling. | G<br>consi<br>bett<br>othe<br>R<br>sim<br>C<br>R |
| **CHLORANTINE RED 4 B**<br>**8 B** | Method No. 1 or Method No. 2. | | II—III.<br>Rather better than B—6 B, on wool and silk I—II. | Moderate.<br>On wool fairly good. | Ver<br>st<br>ace<br>anc<br>m<br>a |
| **DIRECT SAFRANINE G 1688**<br>**B 1687** | Method No. 1. Yellower and fuller shades are obtained by Method No. 2. | | II—III. | On cotton moderate. On wool very good, also fast to milling. | Ve<br>star<br>n |

# tuffs.

| 'ARDS | | | Discharge-ability. | Other Properties. Remarks. |
|---|---|---|---|---|
| s. | Chlorine. | Ironing. | | |
| | Colour destroyed. | Good. | Good with zinc dust and tin crystals. | On account of its good fastness to acids (air) and storing much in demand for brilliant shades on cotton. Applicable for wool (fast to milling and stoving), half-wool and half-silk. In the case of the former the wool is dyed darker, in the latter case the silk is left white. Dyes level and exhausts well.<br>Not sensitive to copper. |
| | Very good, withstands ¼ hour's immersion in bleaching powder solution 2° Tw. | Fairly good. | 8 B good with zinc dust and tin crystals.<br>4 B only with zinc dust. | Very soluble and dye easily level. On this account as well as for their fastness to stoving useful for cotton dyeing, and particularly for apparatus dyeing.<br>Also applicable for wool (fast to milling and stoving), half-wool and half-silk. At low temperatures half-wool is dyed solid, in the case of half-silk the cotton is dyed darker. (Very important.) Dyeings on silk are fast to water.<br>Not affected by copper. |
| | Colour destroyed. On wool good. | Good. | Not dischargeable. | As the above dyestuffs, easily soluble, level dyeing and very fast to acids. On wool fast to milling and stoving. (Dye with acetic acid.) The wool in half-wool is dyed somewhat darker. The silk of half-silk, if dyed in alkaline bath, is lighter. Much used for coloured woven goods and bed tickings. |

## Direct C

| NAME OF DYESTUFF | Dye according to | After-treatment. | FASTN | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | |
| **DIRECT PINK G N 403<br>B N 369** | Method No. 1. Suitable also for cold dyeing. | | II. Better than other Direct Red dyestuffs. | Good. | ( |
| **CHLORANTINE PINK** | Method No. 1. | | II—III. | Good. | Ve<br>wit<br>ace<br>an<br>n |
| **COTTON RED 10 B 588<br>11 B 1436<br>12 B 1733** | Method No. 1. Dye also in the cold, especially 10 B. | | 10 B<br>III.<br>11 B & 12 B<br>II—III. | On cotton moderate.<br>On wool very good. | 11 I<br>wi<br>ace<br>10<br>so |
| **DIRECT PURPLE 146** | Method No. 2. | | On cotton III—IV.<br>On wool and silk good. | On cotton moderate.<br>On wool very good. | |
| **ROSANTHRENE O, R, A<br>B, CB** | Method No. 1. | Method No. 3. Diazotise and develop with $\beta$ Naphthol. | III. | Very good. | |

## tuffs.

| VARDS | | | Dischargeability. | Other Properties. Remarks. |
|---|---|---|---|---|
| s. | Chlorine. | Ironing. | | |
| . | Very good. | Very good. | Easily discharged with zinc dust and tin crystals. | Very important for cotton dyeing, and on account of their beauty and fastness to light for padding cotton print goods. Also for apparatus dyeing. On wool (acetic acid bath) fast to washing and milling. The cotton in half-wool is dyed deeper ; half-silk is dyed solid. (Very important). |
| . | Very good. | Good. | Good with zinc dust and tin crystals. | Is used for the same purposes as Direct Pink. Useful for oxidation discharge effects if not too strong. Gives solid shades on half-wool at temperatures below the boil. The silk in half-silk is dyed lighter. (Much used with Rhodamine for pinks.) Fast to water on silk. Not affected by copper. |
| . | Colour destroyed. | Becomes rather yellower, the original shade returns on cooling. | Good dischargeable with zinc dust and tin crystals. | Exhausts well and are useful for bluish-red and bordeaux shades on cotton. In half-wool the wool is dyed darker. In half-silk the silk is dyed paler. Copper renders the shade duller. |
| l. | Colour destroyed. | Becomes somewhat yellower. | With zinc dust good, with tin crystals not so good. | In spite of its lack of fastness to light and air, much used on account of its cheapness for lower class cotton goods. Not particularly sensitive to copper. |
| l. | Colour destroyed. | Good. | With zinc dust good. | On account of their beautiful shades and fastness to washing, excellently suitable as substitutes for Primuline and similar products. |

## Direct C

| NAME OF DYESTUFF. | Dye according to | After-treatment. | FASTN | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | |
| **DIRECT VIOLET C 979**<br>**CB 997** | Method No 1. | | III. | Moderate. | ] |
| **DIRECT VIOLET B 619**<br>**" " N 582**<br>**TOLAMINE VIOLET 2422** | Method No. 1. | | II. | Good. | ( |
| **CHLORANTINE BORDEAUX B** | Method No. 1. | | II. | Good, considerably better than Cotton Red 11 B. | Ver<br>Wit<br>ace<br>an<br>hydı |
| **CHLORANTINE VIOLET R**<br>**BB** | Method No. 1. | | II. | Good. | Ver<br>Wit<br>ace<br>an<br>hydr |
| **CHLORANTINE LILAC BB**<br>**B**<br>**R** | Method No. 1. | | II. | Very good. | Ver |

## tuffs.

| VARDS | | | Dischargeability. | Other Properties.<br>Remarks. |
|---|---|---|---|---|
| s. | Chlorine. | Ironing. | | |
| | Colour destroyed. | C is turned yellower, CB bluer. | Good with zinc dust and tin crystals. | Dye easily level, suitable for apparatus dyeing. Dyeings on wool fast to milling. Applicable for Dark Bordeaux shades and in mixtures.<br>In half-wool dyeing at the boil, the wool is dyed darker, but at a lower temperature solid shades are produced. In half-silk the cotton is dyed darker. Not affected by copper. |
| d | Withstands the action of dilute bleaching liquor for several minutes. | Slightly reddened. | Dischargeable with zinc dust and tin crystals. | Exhaust well and dye easily level, and are used in piece-dyeing and also for shading purposes.<br>In half-wool and half-silk the cotton is dyed darker. |
| | Very good. Stands ¼ hour immersion in bleaching liquor, 2° Tw. | Good. | Only dischargeable with zinc dust. | Very soluble, dyes easily level. Suitable, on account of its fastness to light and acids, for piece dyeing and for dyeing yarns for coloured woven goods.<br>Dyes the wool in half-wool much lighter and yellower, the silk in half-silk paler. |
| | Very good. | Good. | Good with zinc dust, with tin crystals only in pale shades. | Properties and application similar to Chlorantine Bordeaux B. |
| | Very good. | Good. | Good with zinc dust and tin crystals. | The most beautiful and purest lilac dyestuffs on the market.<br>On account of their solubility, beauty and fastness to light, suitable for padding goods for calico printing. Other properties and application as Chlorantine Violet. |

## Direct Co

| NAME OF DYESTUFF. | Dye according to | After-treatment. | FASTN | |
|---|---|---|---|---|
| | | | Light. | Washing. |
| OPALINE R 893<br>2 G 990<br>5 G 881<br>BRILLIANT OPALINE 797 | Method No. 1. | | Opaline 2 G & 5 G II—III. The rest III. | Moderate. |
| ACETYLENE BLUE 3 R | Method No. 2. For pale shades, Method No. 1. | | II—III. On wool after-treated with copper sulphate good. | Fairly good. On wool, very fast to washing. |
| ACETYLENE BLUE BX<br>DIRECT BLUE BX 944 | Method No. 1. | | II—III. | Good. Rather better than Acetylene Blue 3 R. |
| DIRECT BLUE 3 B 907 | Method No. 1. | | III. | Good. Rather better than Direct Blue BX. |

## stuffs.

| VARDS | | | Dischargeability. | Other Properties.<br>Remarks. |
|---|---|---|---|---|
| es. | Chlorine. | Ironing. | | |
| d<br>. | Colour destroyed. | Becomes redder. | Good with both zinc dust and tin crystals. | In spite of their lack of fastness to alkalies, much used.<br>The dyeings on silk are fast to water.<br>In half wool the wool is little dyed, in half silk dyed in weak alkaline bath the silk remains white.<br>Are all affected by copper, 5 G the least.<br>Dye level and exhaust well. |
| ed<br>hat<br>r. | Colour destroyed. | Becomes redder, the shade returns on cooling. | Good with both zinc dust and tin crystals. | Chiefly used in the production of navy blue shades on cotton.<br>Dyes half wool solid shades.<br>The silk in half silk is dyed paler and redder.<br>Exhausts slowly and dyes very level.<br>Is remarkable for the deep red shade of blue it produces. |
| . | Bad | Good, is turned somewhat redder. | Good with both zinc dust and tin crystals. | Acetylene Blue BX is rather clearer than Direct Blue BX 944, but behaves in a similar manner, and serves for the production of Indigo shades on cotton. Half wool is dyed fairly solid; but in the case of half silk the silk is dyed paler, but not so red as with Acetylene Blue 3 R.<br>Exhaust well and dye level. |
| l. | Colour destroyed. | Good. | Good with both zinc dust and tin crystals. | Gives bright blue shades of good fastness to washing.<br>In half wool the wool is dyed rather paler and redder, in half silk the silk remains white.<br>On wool the fastness to stoving and washing is good. |

## Direct Co

| NAME OF DYESTUFF. | Dye according to | After-treatment. | FASTNE | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | A |
| **ACETYLENE BLUE 3 B**<br>**DIRECT BLUE 2 B 548**<br>**TOLAMINE BLUE 2 B** | Method No. 1 or No. 2. | | II—III. | Good. Bleeds a little into white. | G Wit 50 % a |
| **ACETYLENE BLUE 6 B**<br>**DIRECT LIGHT BLUE 550**<br>**ACETYLENE PURE BLUE** | Method No. 1 or No. 2. May also be dyed cold. | | II—III. Acetylene Blue 6 B is the best. | Very good. | G |
| **DIRECT SKY BLUE GREEN SHADE**<br>**ACETYLENE SKY BLUE** | Method No. 1 or No. 2. | Method No. 4, by after-treatment with 1 % copper sulphate for ½ hour at 60° C. the shade is turned greener. | III. After-treated with copper sulphate. I. | Very good. | G |
| **DIRECT BLUE B**<br>**R**<br>**N** | Method No. 1 or No. 2. | | II—III. | Fairly good. | G |
| **DIRECT BLUE W 104** | Method No. 1. On wool, neutral, or in weak acetic acid bath. | | III. On wool II. | Moderate. On wool good. | G |

## tuffs.

| ARDS | | | Discharge-ability. | Other Properties. Remarks. |
|---|---|---|---|---|
| s. | Chlorine. | Ironing. | | |
| | Bad. | Good. | Good. | Acetylene Blue 3 B is finer in shade than Direct Blue 2 B. Application as last-named colours. Behaviour towards wool, half wool and half silk similar to these. |
| r<br>s<br>e<br>der | Poor. | Very good. | Good. | Acetylene Blue 6 B is somewhat redder and clearer than Direct Light Blue 550. Much used, being a pure, covering bluish-green dyestuff. Dyeings in wool are fast to milling, acids and alkalies. Pale shades on silk are fast to water. Half wool, wool dyed paler. Half silk, silk left almost white. Somewhat affected by tin. Exhaust well and dye very level. |
| | Poor. | Very good. | Good. | Gives still more beautiful shades than the above colours. Application and use as Acetylene Blue 6 B. Half wool is dyed solid; in half silk, the silk is left almost white. Suitable for padding goods for calico printing.<br>On wool duller and redder, fast to stoving and milling. |
| | Colour destroyed. | Turned rather redder, | Good. | First application in cotton dyeing for production of indigo and navy shades. Direct Blue B dyes half wool almost solid shades; Direct Blue R dyes the wool rather redder. |
| | Poor. | Turned slightly redder. | Good. | Exhausts well and dyes level on cotton. Is used principally for wool and half wool.<br>Produces shades on wool fast to milling. |

## Direct Co

| NAME OF DYESTUFF. | Dye according to | After-treatment. | FASTN | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | A |
| Cotton Blue 3 G | Method No. 1. | Method No. 4. With 3 % copper sulphate ½ hour at 60° C. | II—III. After-treated I. | Fairly good. After-treated very good. | C |
| Direct Indigo Blue A<br>B N<br>B K<br>B N K | Method No. 1 or Method No. 2. | Method No. 3. Diazotise and develop with Toluylene Diamine or β Naphthol for dark navy blue. | II—III. Developed I—II. | Fairly good. Developed Good. | C |
| Chlorantine Blue B<br>B B<br>Chlorantine Pure Blue | Method No. 1 or Method No. 2 | | II—III. | Fairly good. | ( |
| Indigene Blue B B<br>B<br>R | Method No. 1. | Method No. 3. Diazotise and develop with β Naphthol. If required an addition of Methylene Blue may be made to the developing bath. | Direct dyeings II—III. Developed I—II. | Developed dyeings very good. After-treatment of the developed dyeings with 2½—5 % Chrome Alum for ½ hour boiling, renders the shades fast to milling. | Ve |

## tuffs.

| VARDS | | | Discharge-ability. | Other Properties. Remarks. |
|---|---|---|---|---|
| s. | Chlorine. | Ironing. | | |
| icu-<br>od. | Colour destroyed. | Turned redder. | Good. | For blue and navy shades. The after-treated dyeing, which is greener, is very fast to light and washing. |
| | Colour destroyed. | Turned redder, the shade returns on cooling. | Good. | Are suitable for cotton dyeing ; also for dyeing half wool. Dye half wool solid in neutral bath. Dyes the cotton only in half silk in alkaline bath.<br>As already indicated, applicable as a developing dyestuff. |
| . | Good, withstands the action of bleaching liquor 2° Tw. | Good. | Good. | Particularly suitable for cotton goods required to undergo a slight bleaching. Chlorantine Pure Blue is remarkable for its pure greenish shade.<br>Soluble and dye very level.<br>In half wool, the wool is dyed paler and redder ; in half silk, the silk remains quite white. Somewhat sensitive towards copper. |
| od. | Bad. | Good. | With zinc dust very good, with tin crystals not so good. Useful, however, for coloured discharges. | For direct dyeing these products are of little interest, the developed dyeings, on account of their fastness to light and washing and the fulness of their shades, being much in demand as substitutes for indigo.<br>Of no interest for wool and half wool.<br>The diazotised and developed dyeings on silk withstand a boiling soap bath. |

## Direct Co

| NAME OF DYESTUFF. | Dye according to | After-treatment. | FASTN | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | A |
| **MELANTHERINE** B H 678<br>B O 514<br>R O 484<br>M 670<br>H W 615<br>3 G 515<br>J H | Method No. 1. | Method No. 3. Diazotise and develop for black with Toluylene Diamine, for dark blue with $\beta$ Naphthol. | Direct dyeings II. developed I—II. | Direct dyeings good. Developed very good, also fast to milling. | C dia dev ver R To Di wit boili d a ( dye aci |

## tuffs.

| ARDS. | | | Discharge-ability. | Other Properties. Remarks. |
|---|---|---|---|---|
| s. | Chlorine. | Ironing. | | |
| | Colour destroyed. | Fairly good. RO becomes strongly reddened on ironing, but recovers its original shade on cooling. | Direct dyeings good with zinc dust, and tin crystals; developed, only with zinc dust. | Melantherine RO, BO and BH are also much used for direct dyeings on account of their good covering power. BH is particularly useful for apparatus dyeing (cops), also HW, which gives a green shade of black, and is principally used for shading purposes (not so much for developing).<br>Melantherine 3 G dyed direct gives a beautiful navy blue. Of all the Melantherines RO gives the deepest and reddest shades; BH gives the finest black. BH, RO, BO and HW are also suitable for half-silk, and cover the cotton well, leaving the silk paler; HW dyes the silk somewhat darker (for Russian Green). The dyeings may also be diazotised and developed.<br>In half-wool dyeing the same colouring matters leave the wool considerably lighter, only HW dyes solid shades. Only direct dyeings find application in the case of half-wool. BH and HW are also useful for dyeing dark blue, dark green, and grey shades on wool, and possess a fair degree of fastness to milling.<br>Melantherine JH gives direct very fine reddish blue shades, and proves very useful in the production of navy blue shades.<br>In half-wool and half-silk goods the animal fibres are but slightly tinted. |

## Direct Co

| NAME OF DYESTUFF. | Dye according to | After-treatment. | FASTN | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | A |
| **INDIGENE BLACK**<br>**B 2980**<br>**H S** | Method No. 1. Dyes also *cold*. Half silk in weak acetic acid bath. | Method No. 3. Diazotise and develop with Toluylene Diamine for black, with 89 parts β Naphthol 1—2 parts Resorcine for blue shades. | Direct dyeings. II. developed I—II. | Direct dyeings moderate, developed good; bleeds, however, into white, on strong washing. | Ver |
| **NEROPALINE P 2938** | Method No. 1. | Method No. 3. Generally as above. | Direct dyeings. II. developed I—II. | Direct dyeings moderate, developed, very good. Better than Indigene Black D. Fairly fast to milling. | Ve |

## tuffs.

| VARDS. | | | Discharge-ability. | Other Properties. Remarks. |
|---|---|---|---|---|
| s. | Chlorine. | Ironing. | | |
| od. | Bad. | Very good. | Good with zinc dust. | Direct dyeings used for grey and in mixtures for fashionable shades, recommended on account of its good levelling powers.<br>The finest developed black.<br>For greener and deeper shades of black use Toluylene Diamine, for bluer shades a mixture of $\beta$ Naphthol and Toluylene Diamine, or 8—9 parts $\beta$ Naphthol and 1—2 parts Resorcine is recommended. Suitable for apparatus dyeing.<br>At low temperatures the cotton in half wool is dyed darker; by raising the temperature solid shades are obtained. Similarly with half silk. For the last-named H S is specially useful, and gives with Toluylene Diamine a fine blue black. |
| od. | Bad. | Very good, | Good with zinc dust. | Shades obtained by developing with Toluylene Diamine are redder than those obtained with Indigene Black B, and not so deep and red as those obtained with Melantherine B H, and are suitable for use as a substitute for Aniline oxidation black. Developed with<br>{ 8—9 parts of $\beta$-Naphthol,<br>1—2 parts Resorcine,<br>a bluer black is produced.<br>Other properties and application as above. |

## Direct Co

| NAME OF DYESTUFF. | Dye according to | After-treatment. | FASTN | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | A |
| Carbide Black S<br>S O<br>Direct Deep Black 1718<br>Direct Black 1602<br>Direct Black A M K<br>Brilliant Direct Black 289 | Method No. 1. | Method No. 4. After-treated with 2 °/₀ bichromate; shade redder, fastness to washing better; still better with 3 °/₀ formaldehyde in cold bath. Method No. 5 gives a brown black fast to washing. | II—III. | Moderate; after-treated with formaldehyde fairly good, with diazo-paranitraniline very good. | Ver<br>suffi<br>wit<br>a<br>dy<br>*aci*<br>(im<br>in<br>dy |
| Carbide Black E | Method No. 1. | Method No. 5 gives a brownish shade of black, fast to washing. Also with formaldehyde. | II—III. | Moderate; with formaldehyde good, with diazo-paranitraniline very good. | P |

## uffs.

| ARDS | | | Discharge-ability. | Other Properties. Remarks. |
|---|---|---|---|---|
| . | Chlorine. | Ironing. | | |
| d. | Good. | Good. | Good with zinc dust, with tin crystals only for grey or for coloured discharges. | Very suitable for dyeing yarn and pieces (also in mixtures for navy and dark brown shades) for apparatus dyeing (Cops), and as a bottom for aniline black.<br>The dyeings on wool do not bleed on milling into white wool threads with which they may be woven.<br>Useful for burl dyeing in alkaline bath.<br>Direct Deep Black 1718 gives a greenish shade, Direct Black 1602 a bluish shade.<br>Affected somewhat by tin.<br>Direct Black A M K is a very cheap black, which is particularly useful for "froth-dyeing" cheeses. |
| | Colour destroyed. | Good. | Good with zinc dust, poorer with tin crystals; sufficient for coloured discharges. | In spite of its inferior fastness to acids, much used on account of its cheapness and good covering power.<br>A useful wool, cotton and half-wool dyestuff. Suitable also for burl dyeing in the milling machine. |

## Direct C

| NAME OF DYESTUFF. | Dye according to | After-treatment. | FASTN | |
|---|---|---|---|---|
| | | | Light. | Washing. |
| **Carbide Black R I** | Method No. 1. | | II—III. | Moderate. |
| **Direct Grey R**<br>**B**<br>**R O 1474**<br>**1368** | Method No. 1. | | II—III. | Good. |
| **Direct Green B 695**<br>**G 1574**<br>**J**<br>**Tolamine Green 2040** | Method No. 2 or No. 1. | Method No. 4. Direct Green B 695 and Tolamine green 2040 are rendered faster to water and washing, by after-treatment with 3 % Chrome Alum. | II—III. | Good, particularly in pale shades. |
| **Direct Olive G** | Method No. 1. | | II—III. | Good. |

# tuffs.

| ARDS. | | | Discharge-ability. | Other Properties. Remarks. |
|---|---|---|---|---|
| s. | Chlorine. | Ironing. | | |
| | Colour destroyed. | Good. | As above. | Applicable for cotton and half wool, giving solid shades on the latter. On half silk, dyes the silk rather paler.<br>Particularly useful for paper dyeing; packing and needle paper, &c. Also for chrome leather. |
| | Colour destroyed. | Whilst hot rather redder, but original shade returns on cooling. | Good. | On account of their good fastness to washing, light and acids, much in request for grey linings.<br>In union goods, they dye the wool and silk respectively rather paler and yellower or redder. |
| e the l e- n g. | Direct Green J. is fast, the rest are destroyed. | Good.<br>Are turned rather duller, but the original shade returns on cooling. | Good. | For all purposes in the cotton dye-house. Dye half wool and half silk goods solid shades.<br>On wool fast to washing and milling.<br>Rendered somewhat duller by copper. |
| | Colour destroyed. | Good. | Good | An excellent dyestuff for shading purposes.<br>Rather sensitive towards copper. |

# The Pyrogene (Sulphur) Dyestuffs.

The Pyrogene Dyestuffs are similar in many respects to the direct Cotton Dyestuffs, but have the tremendous advantage over the latter of being absolutely fast to washing, milling, acids, and in most cases to light. In spite of their comparative novelty, these useful properties have already gained for them extensive application in practice.

In many cases they are now being used as effective substitutes for such dyestuffs as aniline black, indigo, catechu and other dyestuffs, hitherto the fastest known colouring matters.

## General Method of Application of the Pyrogene Dyestuffs.

The usual method of dyeing with these colouring matters is as follows :—

| | |
|---|---|
| 100 | lbs. Cotton. |
| 150—200 | gallons water. |
| 5—15 | lbs. Dyestuff. |
| 7½—10 | lbs. Sulphide of Soda Cryst. (¾ oz. per gallon). |
| 7⅓—10 | lbs. Soda (¾ oz. per gallon). |
| 15—60 | lbs. Common Salt (1½—5 ozs. per gallon). |

Dye for one hour at 70—90° C., wash and afterwards treat as recommended for the various dyestuffs, wash and dry.

Half the quantity of fused sulphide of soda may be substituted for the above quantities of the crystalline product.

## Mode of Dissolving the Pyrogene Dyestuffs.

The majority of the Pyrogene dyestuffs are dissolved very easily by stirring for a short time with hot water containing a little sulphide of soda.

For the purpose of dissolving these colours the use of condensed water is recommended ; very hard water should be corrected by previously boiling with a little soda.

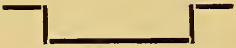
### The Addition of Salt.

The use of common salt is more advantagous than that of Glauber's salt ; 10 parts of the former may be replaced by 12 parts of calcinated Glauber's salt (= 24 parts crystals). In apparatus dyeing where soft water is available, Glauber's salt is preferable.

### Dyesticks (Dyeing Partly and Wholly Immersed).

Most of the Pyrogene colours may, with careful treatment, be dyed in the usual manner, partly immersed ; however, in the case of

Pyrogene Black B and G,
Pyrogene Direct Blue, red shade and green shade,
New Pyrogene Direct Blue,
Pyrogene Navy Blue, and
Pyrogene Indigo Blue,

the use of iron sticks bent in this form  is recommended, in order that the yarn may be wholly immersed during the dyeing operation. It is necessary to turn the yarn 2 or 3 times at the beginning of the operation, and afterwards once every ten minutes until finished.

### Further Employment of Old Baths.

The baths are not fully exhausted, and after 3 or 4 operations it suffices to add $\frac{2}{3}$ of the original amounts of dyestuff and sulphide of soda, and the amounts of soda and salt corresponding to the quantity of water added to bring up the bath to the original volume.

## Amount of Salt Contained in the Bath.

The amount of salt contained in the bath is estimated by means of the hydrometer. For blacks the cold dye liquor should register 7—10° Tw., for blues 5—6° Tw.

## Topping with Basic Dyestuffs.

The Pyrogene dyestuffs may be topped, after washing, in a fresh bath with suitable basic dyestuffs, which, being so firmly fixed on the dyestuff already on the fibre, do not appreciably diminish the fastness to washing of the dyed goods.

## Dyestuffs for Shading Purposes.

Certain direct cotton colours withstand excellently the action of sodium sulphide, and may be dyed in the same bath with the Pyrogene dyestuffs, and in many cases are used for shading purposes. The fastness of such dyeings, however, is hardly as good as those produced with Pyrogene colours alone.

As suitable dyestuffs for this purpose may be mentioned—

Chlorantine Yellow J J and J G.
Fast Yellow R 1209.
Chlorantine Orange T R and T R R.
Direct Safranine G and B.
Direct Indigo Blue A.

## Exclusion of Copper Vessels.

Copper vessels and pipes should be strictly avoided when using these dyestuffs ; wood, iron and lead are the most suitable materials for the construction of dyeing apparatus, steam pipes, &c.

## List of the Pyrogene Dyestuffs.

The Society of Chemical Industry is in the fortunate position of being able to offer a full collection of Pyrogene colours, with which one may produce all the shades obtainable, up to the present, with sulphur dyestuffs.

We append a list of these colours, and in the following pages indicate their most important special properties as regards dyeing and fastness, and their use in the various branches of the cotton industry.

Pyrogene Black G, B, BD, GN, NB, GE.
Pyrogene Blue R, and R R.
Pyrogene Direct Blue, red shade and green shade.
New Pyrogene Direct Blue.
Pyrogene Navy Blue.
Pyrogene Indigo Blue B.
Pyrogene Brown G, 3 G, 5 G, BD, M, R, V.
Pyrogene Cutch 2 G.
Pyrogene Grey B, G, R.
Pyrogene Green B.
Pyrogene Olive N.
Pyrogene Yellow M.

To this class also belong—

Thiophenol Black T extra, 2 B extra, and 2 R extra.

# Pyrogene Black G, B, BD, GN, NB, GE, on Yarn and Loose Cotton.

The various brands of Pyrogene Black are dyed on yarn and loose cotton according to Method No. 6; for the first bath about 15 % colour is required, 8—10 % being sufficient for subsequent baths.

## Apparatus for Wringing Yarn.

After dyeing the yarn is immediately wrung out, either by passing through a pair of squeezing rollers, or by means of a wringing post fixed over the dye vessel, and washed well several times.

*(See the accompanying sketch in the Appendix).*

The first washing water may be used for filling up the dye vessel for the next operation.

## After-treatment with Metallic Salts.

The brands GE, NB and the very cheap brand BD may be dyed on the ordinary wooden sticks, and in practice it has been found unnecessary to subject these brands to any after-treatment, whereas with the brands G, GN and B, as much for the shade as for the permanency of the dyed colours, an after-treatment of the dyed and well-washed goods with metallic salts is very advantageous.

The amounts reckoned on the weight of the goods are as follows :—

| | |
|---|---|
| 3 % Bichromate of Potash<br>3 ,, Acetic Acid, 12° Tw. | for red tones. |
| 3 ,, Copper Sulphate<br>3 ,, Acetic Acid, 12 ° Tw. | for blue tones. |
| 3 ,, Chrome Alum<br>3 ,, Acetic Acid, 12° Tw. | for green tones.<br>(Aniline black shade). |

A mixture of

1½ % Bichromate of Potash.
1½ ,, Copper Sulphate.
3 ,, Acetic Acid, 12° Tw.

or of

1½ ,, Bichromate of Potash.
1½ ,, Chrome Alum.
3 ,, Acetic Acid, 12° Tw.

gives, particularly with the much-used brand G, a deep coal black shade.

It is not customary to subject loose cotton to this after-treatment with metallic salts ; chrome alum, however, gives particularly good results.

The goods are after-treated with the above quantities of metallic salts for half an hour at 60—70° C. (140—160° F.)

## Employment of the various Brands of Pyrogene Black.

The marks G, GN and B are particularly suitable, on account of the beauty of the shades they are capable of producing, for piece dyeing, and have been extensively introduced ; here, also, an after-treatment with metallic salts is customary. The cheaper brands, GE, NB and BD are also used for this purpose, but are of especial importance in the dyeing of warps and of loose cotton, and may be applied either with or without after-treatment.

As already mentioned, the Pyrogene Blacks may be topped with basic dyestuffs in a fresh bath for the production of particular shades; this method, however, is but seldom used.

By topping with a very small quantity (say $\frac{1}{10}$ $^{\circ}/_{\circ}$) of a basic red dyestuff (*e.g.* Jute Red, Cerise, Safranine), the shade produced with the very cheap greenish Black BD is rendered considerably deeper and somewhat redder.

The dyeings thus obtained are used as a cheap black for yarn intended for coloured woven goods, and possess a sufficient fastness to washing for this purpose.

### Prevention of Destruction of the Fibre.

In order to guard against any possible destruction of the fibre, it is advantageous to add to the last wash water,

$1\frac{1}{2}$—$4\frac{1}{2}$ ozs. Sodium Acetate } per 10 gallons.
or, $\frac{3}{4}$—2 ozs. Soda. } per 10 gallons.

### Finishing.

The shade of the dyeings obtained by after-treatment with metallic salts is considerably improved if the goods are finished by working for $\frac{1}{4}$—$\frac{1}{2}$ hour at 70—80° C. (158—176° F.) in a bath containing

$1\frac{1}{2}$—3 % Potato Starch.
1 —2 ,, Tallow, Lard or Cocoanut Oil.

This treatment is particularly suitable for cotton warps ; the starch and fat may also be added direct to the bath containing the metallic salts.

A simple soaping at 60° (140° F.) with a slight addition of soda, may serve instead of the above finishing process ; this increases the lustre of the cotton.

### The Dyeing of Loose Cotton, Yarn, Cops, Cheeses, Sliver, &c., in the Various Forms of Mechanical Apparatus.

As already stated, loose cotton is generally dyed according to the same recipe as that advised for yarn ; in dyeing in the various forms of mechanical apparatus, the amount of dye liquor may be decreased to 6—8 times the weight of goods, and it is then advantageous to make an addition of $\frac{1}{10}$—$\frac{1}{3}$ pint Turkey red oil per 10 gallons of dye liquor.

When dyeing in apparatus with Pyrogene Black G and B, the first bath should contain 2—$2\frac{1}{2}$ ozs. colour per gallon, the other brands $2\frac{1}{2}$—$3\frac{1}{2}$ ozs. per gallon. For the rest we refer you to the proportions given in the Tables on Pages 82—83.

The washing and after-treatment may be carried out in apparatus, but it should be borne in mind that the apparatus should be so constructed that the goods are not exposed to the action of the air during the dyeing operation.

## Pyrogene Black on Cotton Warps.

For the dyeing of cotton warps Pyrogene Black has been found particularly suitable ; a concentrated dye-bath is employed, for example—

| | | | |
|---|---|---|---|
| 2 —2½ | lbs. | Pyrogene Black. | per 10 gallons water. |
| ¾ | lb. | Sodium Sulphide. | |
| ¼— ½ | lb. | Solway Soda. | |
| 2½—3½ | lbs. | Salt. | |

The warps are passed 2—4 times through the boiling dye liquor, squeezed, and washed thoroughly in another box ; the subsequent after-treatment is carried out also by passing through an apparatus similar to that used for the dyeing operation.

## Dyeing with Pyrogene Black on the Jigger.

The dyeing of piece goods is generally carried out on the jigger ; we recommend the following recipe, which has been advantageously employed in practice :—

For 100 lbs. Goods.

| | |
|---|---|
| 13—17 | lbs. Dyestuff. |
| 30 | gallons water. |
| 2½—3 | lbs. Sodium Sulphide Cryst. |
| ¾ | lb. Solway Soda. |
| 4½ | lbs. Dextrine. |
| 9—13½ | lbs. Salt. |

The goods are run 6—8 ends through the liquor at a temperature just below the boil, and passed through the squeezing apparatus below described, into a second jigger in which they are well washed. The first wash water is used for filling up the dyebath. In the second jigger is also carried out the after-treatment; a fresh bath is prepared, at a temperature of 70—80° C., with the most suitable metallic salt for producing the shade desired. The goods are afterwards washed well and dried.

The after-treatment may also be combined with the finishing process, in which case the requisite quantity of metallic salt is added to the finishing mixture.

## Squeezing Apparatus on the Jigger.

The squeezing arrangement for the jigger consists of a roller working on a lever, over the roller nearest to the second jigger. The squeezing power of this may be regulated by means of weights; during the dyeing operation this roller is raised; when running off the goods into the second jigger, it is lowered and works on the jigger roller, effecting an even squeezing of the goods.

*(A sketch of the apparatus is given in the Appendix.)*

## Further Operations in Old Baths.

When dyeing in old baths, additions of 8—11°/₀ dyestuff and 3—4 °/₀ sodium sulphide are required. The additions of soda, dextrine and salt vary according to the quantity of water required to bring the bath up to its original volume.

## The Dyeing of Smooth and Raised Velvet.

Velvet is dyed with Pyrogene dyestuffs on the jigger in the same way as other cotton piece goods; except the passage through squeezing rollers, which would crush the pile of the goods. The dye liquor is removed by a thorough washing effected by means of spirt pipes placed either before or in the second jigger.

## Dyeing with Pyrogene Black in the Winch Machine.

When dyeing in the winch machine, the proportions given in Method No. 6 are employed.

This method is very seldom used except for heavy goods, and as far as possible the goods should be kept beneath the surface of the liquor.

## Dyeing with Pyrogene Black in the Open Width Machine.

In large concerns the continuous machine (open width) is much used ; by means of this machine a high rate of production can be maintained, and it allows of a good black being dyed in 3—5 minutes by a single passage through the machine.

This machine, like the open width washing machine, consists of 4—5 boxes, of which the first 2 or 3, which are separated from one another by perforated partitions, contain the dye liquor, whilst the two last serve for the purpose of washing the goods, being fitted with spirt pipes.

Over each of the dividing partitions is fitted a pair of squeezing rollers.

*(See the sketch of this machine in the Appendix).*

## Recipe for dyeing in the Continuous Dyeing Machine.

The first bath is prepared as follows :—

For 10 gallons dye liquor.
2—2½ lbs. Pyrogene Black.
¾—1 lb. Sodium Sulphide.
1¼—½ lb. Solvay Soda.
½—2½ lbs. Salt.

The additions to this bath, calculated on the weight of the goods, are :—

| | | |
|---|---|---|
| 8—11 | °/₀ | Pyrogene Black. |
| 2¾—4 | ,, | Sodium Sulphide. |
| 1½—2 | ,, | Solvay Soda. |
| 1—2½ | ,, | Salt. |

which are dissolved in the requisite amount of water and added to the bath whilst the machine is running.

The vats are warmed by means of closed iron coils, as copper and brass fittings in the apparatus must be strictly avoided ; the temperature of the liquor should be just below the boil, although a temperature of 50—60° C. suffices for lighter goods.

After passing through the dyeing machine the goods are eventually after-treated, in another open width machine, with metallic salts.

## Dyeing with Pyrogene Black in the Padding Machine.

The padding machine is used extensively for the dyeing of lighter cotton goods.

This machine is similar to that used in printing, but is built without any copper parts whatever ; it consists essentially of two squeezing rollers, and a fairly large trough of about 20—30 gallons capacity, fitted with several (4—6) guide rollers, and a closed iron coil for heating the liquor.

*(See sketch in the Appendix).*

The goods are dyed at a temperature of 80—90° C. in 2 or 4 ends through the machine, the operation being so conducted that the end of the goods which first enters the machine during the first passage, is the last to pass through during the second passage.

The first bath contains per 10 gallons of liquor.

| | |
|---|---|
| 2—3 lbs. | Pyrogene Black. |
| ¾ lb. | Sodium Sulphide Cryst. |
| ¼ lb. | Turkey Red Oil. |
| 1½—2 lbs. | Salt. |
| 1—1½ lbs. | Dextrine. |

During the course of the operation the following addition is gradually made :—

| | | |
|---|---|---|
| 8—11 % | Pyrogene Black. | reckoned on the weight of the goods. |
| 2—3½ ,, | Sodium Sulphide. | |
| ½—1 ,, | Turkey Red Oil. | |
| 1—3 ,, | Salt. | |
| 2 ,, | Dextrine. | |

After passing through the padding machine the goods are washed well, and eventually after-treated either in another padding machine, in an open width machine, or during the finishing process.

## Pyrogene Black on Hosiery Goods.

Hosiery and knitted goods are dyed according to Method No. 6 ; after dyeing they should be immediately washed, and if perfect fastness to rubbing and a soft handle is required, after the treatment with metallic salts, they should be soaped in a bath containing soda at 70—80° C.

# Thiophenol Black T extra, 2 B extra, 2 R extra.

Under the above names we have brought into the the market three new Sulphur dyestuffs, which, in consequence of their excellent properties of great covering power and low cost, are sure to meet with extensive application in practice.

Whereas the various Pyrogene Blacks are principally used in the production of the best quality bloomed blacks intended as substitutes for oxidation blacks, the various brands of Thiophenol Black, on account of their full deep shades and low cost, are suitable for obtaining good imitations of one bath aniline blacks, and are applicable for yarn intended for coloured woven goods, as well as for all other purposes.

**Our Thiophenol Blacks are at the present time the most valuable cheap blacks on the market, combining low cost of production of dyeings and an easy method of application with beauty of shade and excellent properties of fastness.**

Thiophenol Black T extra gives, without any aftertreatment, a deep coal-black shade. The 2 R extra brand gives a deep reddish black, and the 2 B extra brand a bloomy blue black.

The fastness of the various Thiophenol Blacks towards air, light, washing, milling and cross-dyeing in acid bath is excellent ; only chlorine destroys these colours.

The Thiophenol Blacks are applied according to the following recipe, which is a modification of the process usually employed for Pyrogene Blacks :—

| | |
|---|---|
| 100 lbs. | Cotton Yarn. |
| 160—200 | gallons water. |
| 10 lbs. | Dyestuff (in the case of 2 B extra, 12 lbs.) |
| 25 lbs. | Sodium Sulphite (2½ times the weight of Dyestuff). |
| 8— 10 lbs. | Soda Calc. (5 lbs. per 100 gals). |
| 48— 60 lbs. | Salt (30 lbs. per 100 gals.) ; or, |
| 80—100 lbs. | Calc. Glauber's Salt (50 lbs. per 100 gals.) |

The dyestuff is dissolved by boiling for a short time with the necessary amount of sodium sulphide; the solution is added to the dyebath, in which the soda has been previously dissolved.

The yarn is dyed for 1—1¼ hour at 70—90° C. on the usual bent sticks, washed and dried.

In a standing bath, half the above quantity of dyestuff suffices and 1½ times this amount of sodium sulphide.

The bath, when cold, should register about 10—12° Tw.

In the case of Thiophenol Black 2 B extra, ⅕ more dyestuff is used than of the other brands on account of its very bluish shade.

Although the brand T extra is most commonly employed, we recommend the brand 2 R extra more especially for coloured woven goods in which the cotton is very highly starched and requires on that account to be dyed a very full black.

As already stated, the Thiophenol Blacks require no after-treatment, but they are rendered considerably deeper and more bloomy by finishing with 2 per cent. oil or lard and ½ per cent. soap, this addition being made to the last wash water.

The following oil-finishing bath has also been found useful:—

For 100 lbs. Yarn.

| | |
|---|---|
| 180—200 | gallons water. |
| 1 | lb. Cottonseed or Cocoanut Oil. |
| 1½— 2 | lbs. Soap. |
| ½ | lb. Starch, and in the case of warps, |
| ½ | lb. Glue made into a paste with water. |

Work ¼ hour, wring and dry.

On account of their excellent solubility the various brands of Thiophenol Black are suitable for apparatus dyeing. When dyeing on the jigger they exhibit no tendency to "bronze" or "list" the goods.

As regards the recipes for using these colours in the various forms of apparatus, these we indicate in the following tables :—

| | JIGGER. | | PADDING MACHINE. | | OPEN WIDTH MACHINE. | |
|---|---|---|---|---|---|---|
| | First Bath. | Standing Bath. | First Bath. | Standing Bath. | First Bath. | Standing Bath. |
| Dyestuff | 9—10 % | %<br>5—6 | lbs.<br>12—20 | %<br>5—6 | 10—15% | %<br>5—6 |
| Sodium Sulphide | 18—25 % | 7—10 | 24—35 | 7—10 | 20-35lbs. | 6—10 |
| Solvay Soda | 5 lbs. | 2 | 3—5 | 2 | 3—5 lbs. | 2 |
| Salt or Calc. Glauber's Salt | 20—30 lbs. | 5—10 | 2—3 | 2—10 | 20-30lbs. | 2—10 |
| Turkey Red Oil | — | — | 0—2 | 0—½ | 0-2lbs. | 0—0·5 |

| | MECHANICAL APPARATUS. (Obermaier). | | WARP DYEING. | | COP DYEING. (Bath=16 to 20 times weight of goods). | |
|---|---|---|---|---|---|---|
| | First Bath. | Standing Bath. | First Bath. | Standing Bath. | First Bath. | Standing Bath. |
| Dyestuff | 10—16 % | %<br>5—6 | 10—15% | %<br>5—6 | lbs.<br>10—15 | 5—6 |
| Sodium Sulphide | 25—45 % | 8—12 | 22-35lbs. | 6—10 | 25—40 | 6—12 |
| Solvay Soda | 5 lbs. | 2 | 3—5 lbs. | 2 | 5 | 2 |
| Salt or Calc. Glauber's Salt | 40—50 lbs. | 5—8 | 25-40lbs. | 6—12 | 30—50 | 6—15 |
| Turkey Red Oil | 0—3 lbs. | ½ | — | — | 3 | ½—1 |

The percentages are calculated on the weight of goods, the weights given refer to the number of pounds per 100 gallons dye-liquor. A point worthy of note is the fact that the Thiophenol Blacks give an absolutely pure white when discharged by means of oxidising agents. In this way a very fine and fast imitation of the Prudhomme style black and white prints may be obtained; we give further details of this process under the paragraph "Discharging of Pyrogene Dyestuffs."

## Pyrogene Blue R and RR.

Pyrogene Blue R and RR are developing dyestuffs, giving very fine indigo shades, which cannot be approached by any competing product on the market. In consequence of their excellent fastness to washing, light, acids and rubbing, and the simple methods of dyeing and developing by which they are applied, they constitute a perfect substitute for indigo.

The fastness to washing and milling, as already stated, is excellent; whereas indigo, after repeated washing in the domestic laundry becomes paler, Pyrogene Blue R and RR retain their full and deep shade; their fastness to dilute mineral acids also renders them suitable for cotton warps which are intended to be woven with wool and afterwards dyed in acid bath. They are even faster to light than indigo.

It is not possible to obtain level shades of equal fastness to rubbing with indigo as with Pyrogene Blue R and RR.

As regards their dyeing properties, they are very similar to Pyrogene Black, and may be dyed in the usual manner according to Method No. 6; it may be remarked, however, that the direct dyeings obtained with Pyrogene Blue R and RR are of no particular interest, but are converted into the fine indigo blue shade by a simple after-treatment, viz., by oxidation.

There are several methods of carrying out this after-treatment, and it depends on the circumstances of any particular case, which of these methods is selected.

The following are the principal methods :—

1. Oxidation with warm damp air in the presence of Turpentine Oil.

2. After-treatment with Eau de Javelle.

### Oxidation with Warm Damp Air in the presence of Turpentine Oil. (*Patent applied for.*)

For carrying out this operation, Method No. 6 must be somewhat modified, the first bath being prepared as follows :—

For 100 lbs cotton :

| | | |
|---|---|---|
| 150—200 | gallons | water (15—20 times the weight of the goods). |
| 4—15 | lbs. | Dyestuff. |
| 6—10 | lbs. | Sodium Sulphide. |
| 2½—4 | pints | Caustic Soda, 76° Tw. |
| ½—1 | pint | Turpentine Oil. |
| 3—7½ | lbs. | Soda. |
| 7—20 | lbs. | Salt. |

The goods are dyed for one hour at 70—90° C. The method of working is the same as with Pyrogene Black.

After the third or fourth bath, ¾ of the quantities of dyestuff and sodium sulphide given above, suffice to replenish the bath ; the other additions vary according to the amount of water added.

After dyeing, the goods are wrung out in the way already indicated for Pyrogene Black, and without washing, exposed to the action of warm damp air.

For this purpose, one of the following forms of apparatus is employed :—

(*a*) An oxidation chamber, such as is usually employed for developing aniline black.

(*b*) A drying room, into which steam is blown.

(*c*) A wooden box (an old dye vat will answer the purpose quite well), into which warm damp air, at a temperature of 100° C., is blown through a perforated pipe fixed in the bottom. The warm damp air is prepared by mixing steam and air in a suitable apparatus.

In the last case the turpentine oil may be omitted from the dye bath. The pipe through which the air is pumped is then fitted with a funnel, in the narrower part of which is a gauze sieve ; in this is placed cotton wool impregnated with turpentine oil. The air, in passing through this funnel, carries into the box a certain amount of turpentine vapour, which accelerates the oxidation considerably, and results in the production of full and even shades. This method of applying turpentine oil has proved very successful.

The use of turpentine oil in the dye bath, or in the above manner, is conducive, in a great measure, towards the production of even shades.

For oxidation with (*a*) and (*b*) 2—3 hours are required, with (*c*) the blue is developed in $\frac{1}{2}$—$\frac{3}{4}$ hour.

In all these forms of apparatus the cotton (in the case of yarn) must not be hung too close together on the sticks, and it should be protected against water drops. For this reason the yarn is covered with a woollen cloth.

## Developing by allowing to Lie in a Warm Place.

The oxidation to blue also takes place if the cotton (loose, yarn, or piece) is allowed to lie overnight covered up in a warm room ; the ease with which our blue is oxidised comes here into account, and this method is particularly suitable for loose cotton.

Piece goods are developed to blue by passing the dyed, unwashed goods a few times through the Mather-Platt, or by steaming in the presence of air, in the usual steaming chamber, as employed for calico printing.

After developing the goods are rinsed at 60—70° C., either with or without the addition of soda, and afterwards washed well in cold water.

### Developing with Eau de Javelle and Caustic Soda.

The dyeing operation is conducted according to the instructions given for Method No. 6 ; an addition of caustic soda and turpentine oil is in this case unnecessary.

After dyeing and wringing out the goods are well washed and developed for ½—¾ hour in the following bath :—

DEVELOPING BATH.

For every 10 gallons cold water
1½—2 pints Eau de Javelle. } According to the
1 —1¼ pints Caustic Soda 76° Tw } depth of shade.

For subsequent operations ⅓ of the original quantity of caustic soda and ⅔ of the original quantity of Eau de Javelle may be added to the old bath, but as the cost of the materials is very small this is not advised.

By a short treatment in the developing bath greener shades are obtained, longer treatment produces redder shades.

The development of piece goods is conducted in the winch machine. After developing the goods are rinsed and afterwards soaped, or passed through a hot solution of soda.

The Eau de Javelle mentioned in the above recipe is prepared as follows :—

A { 65 lbs. Bleaching Powder (33 °/o) mixed with
25 gallons cold water.

B {
18 lbs. Solvay Soda, dissolved in
10 gallons hot water, and mixed with
10 ,, cold water.

The two solutions A and B are mixed and stirred for ½ hour, and produce, after decanting and washing the precipitate twice, 100 gallons of Eau de Javelle.

This solution keeps good for several months in covered vessels.

In place of Eau de Javelle an equal quantity of bleaching powder solution 12°Tw. may be used ; in this case a particularly good washing is necessary after the developing operation.

### Topping with Basic Dyestuffs.

As already stated, the Pyrogene dyestuffs exhibit a considerable affinity for the Basic dyestuffs, with which they may be topped in a fresh bath ; and although Pyrogene Blue R and RR, on account of their brilliant shades rarely require such treatment, for the sake of completeness

Methylene Blue G and
New Fast Blue MD and RS

may be mentioned as being particularly suitable for this purpose. A little acetic acid or alum is added to the topping bath.

### Topping with Indigo.

Indigo may be applied to goods dyed with Pyrogene Blue R in the indigo vat ; and as the latter acts as a developer to the Pyrogene Blue R, after washing, the dyed goods may be topped in one or two dips in the indigo vat, a useful and fast indigo blue being thus produced.

An after-treatment with metallic salts is neither necessary nor usual for Pyrogene Blue R and RR ; however, by treating for ½ hour at 60—80° C. in a bath containing:—

1 % Bichromate of Potash.
1 ,, Copper Sulphate.
2 ,, Acetic Acid.

the fastness to washing of Pyrogene Blue is slightly increased, without effecting any considerable alteration in the shade.

Besides the above described methods, Pyrogene Blue R and RR, in consequence of the ease with which they may be oxidised, may be applied according to all the usual methods recommended for this class of dyestuffs.

## The Dyeing of Cotton Yarn and Warps.

Cotton yarn is dyed and developed according to the method detailed above ; similarly, loose cotton is usually dyed in the same way, and developed to blue by means of warm damp air (*i.e.*, by allowing to lie overnight in baskets lined with waterproofed paper.)

Cotton yarn in warp form is dyed in the same way, and in the same form of apparatus as for Pyrogene Black.

The first bath is prepared as follows:—

For 10 gallons of dye liquor,

¾—1½ lbs. Pyrogene Blue R.
½—1 lb. Sodium Sulphide.
2—4 ozs. Soda.

Only for development by air:
¼—½ pint Caustic Soda 76° Tw.
0—1 oz. Turpentine Oil (not absolutely necessary.
½—1¼ lbs. Salt.

During the course of the dyeing operation the following addition is gradually made, the amounts being calculated on the weight of the warps.

5—11 % Pyrogene Blue R or RR.
2—4 ,, Sodium Sulphide.
1—2 ,, Caustic Soda, 76° Tw.
0—½ ,, Turpentine Oil.
1 ,, Soda.
3—7 ,, Salt.

After 2—4 ends through the boiling bath, the goods are developed without washing in warm damp air, and afterwards well washed.

When developing with Eau de Javelle (this operation is best carried out in the winch machine), the caustic soda and turpentine oil are omitted from the dyebath, and the goods are well rinsed.

## Dyeing with Pyrogene Blue R and RR in Mechanical Apparatus.

Generally speaking, when dyeing loose cotton, yarn, sliver, and cops in mechanical apparatus, the dyeing recipes given for yarn are applicable ; these must, however, be modified according to the nature of the apparatus and the quantity of dye liquor necessary for working ; an addition of

$\frac{1}{8}$—$\frac{1}{4}$ pint Turkey Red Oil per 10 gallons liquor.

is advantageous, in order to ensure rapid impregnation and thorough penetration of the goods.

The developing is generally carried out in the same apparatus, and is effected by first rinsing the dyed goods with a cold solution containing

$$\left.\begin{array}{l}\tfrac{1}{8}\text{—}\tfrac{1}{4}\text{ pint Caustic Soda, 76° Tw.}\\ 2\text{—}4\text{ ozs. Sodium Sulphide}\end{array}\right\}\text{ per 10 gallons.}$$

after which damp warm air is blown through the apparatus for half an hour.

In dyeing with these colouring matters it is recommended to use the purer crystallised Glauber's salt in place of common salt.

Water free from chalk is preferably employed.

The following quantities may be taken as a guide to the preparation of the first bath :—

| | | |
|---|---|---|
| 7 —15 % | Pyrogene Blue | |
| ½— ¾ lb. | Sodium Sulphide | per 10 gallons. |
| ¼ pint | Turkey Red Oil | |
| ¼— ½ pint | Caustic Soda, 76° Tw. | |
| 2 —4 ozs. | Soda | |
| ¾—1 lb. | Glauber's Salt Crystal | |

After the second bath the additions necessary for further operations are :—

| | | |
|---|---|---|
| 5—11 % | Pyrogene Blue | reckoned on the weight of the goods. |
| 3— 5 ,, | Sodium Sulphide | |

The other additions vary according to the amount of water added. The same precautions must be observed in applying this dyestuff as those already mentioned in the case of the Pyrogene Black.

For further particulars we refer you to the tables of instructions given in pages 82-83.

## Pyrogene Blue R and RR on Piece Goods.

The dyeing of piece goods is generally carried out on the jigger, which should be fitted with the same arrangement for squeezing as for Pyrogene Black ; the operations of dyeing and squeezing are conducted in the same way, except that when developing with warm damp air the goods do not require washing. After dyeing, the goods are simply squeezed and developed, according to the method already described, either in the oxidation chamber, in the Mather-Platt, in the steaming chamber in the presence of air, or simply by allowing to lie for some time in a warm place.

### Dyeing on the Jigger.

The first bath is prepared, in this case, as follows :—

| | | |
|---|---|---|
| 5—15 % | Pyrogene Blue. | per 10 gallons dye liquor. |
| ½—1 | lb. Sodium Sulphide. | |
| ¼—½ | pint Caustic Soda 76° Tw. | |
| 0—1/16 | pint Turpentine Oil. | |
| ½—¾ | lb. Soda. | |
| ½—1¼ | lb. Salt. | |

For a standing bath the additions are reduced in the usual way. (*See Pyrogene Black, Page 59*).

When it is intended to develop the piece goods with Eau de Javelle and caustic soda, the turpentine and caustic soda are omitted from the dyebath, and the goods are well washed before developing.

Where a great rate of production is of importance, in calico printing particularly, Pyrogene Blue is often dyed on the padding machine. (*See Sketch in the Appendix*).

## Dyeing on the Padding Machine.

The apparatus and method of working are the same as already described for Pyrogene Black, excepting the after-treatment with metallic salts, which in the case of Pyrogene Blue R is not necessary, the blue colour being developed in the usual way.

The first bath is prepared as follows :—

| | | |
|---|---|---|
| ¾—1½ | lb. Pyrogene Blue. | per 10 gallons dye-liquor. |
| ½—1 | lb. Sodium Sulphide. | |
| ¼— ½ | lb. Soda. | |
| ½—1½ | lb. Salt. | |
| ½— ⅝ | pint Caustic Soda. | |
| 0—1/16 | pint Turpentine Oil. | |

For further operations the bath is replenished with the following addition :—

| | | | |
|---|---|---|---|
| 4 —12 | % | Pyrogene Blue. | reckoned on the weight of the goods. |
| 2½— 4 | ,, | Sodium Sulphide | |
| 1 — 2 | ,, | Soda. | |
| 2 | ,, | Salt. | |
| 1½— 2 | ,, | Caustic Soda, 76° Tw. | |
| 0— ¼ | ,, | Turpentine Oil. | |

## Dyeing on the Continuous Machine (in open width),

Is conducted in the same way as with Pyrogene Black. (*See Diagram in the Appendix.*)

The first bath contains—

| | | | |
|---|---|---|---|
| 1—1½ | lb. | Pyrogene Blue | per 10 gallons liquor. |
| ½— ¾ | lb. | Sodium Sulphide. | |
| ½— ¾ | lb. | Salt. | |

Caustic soda, turpentine and soda as usual.

The bath is replenished for further operations with—

| | | | |
|---|---|---|---|
| 5 —13 | % | Pyrogene Blue. | calculated on the weight of the goods. |
| 2 — 4 | ,, | Sodium Sulphide Cryst. | |
| 2 — 3 | ,, | Salt. | |
| 1½— 2 | ,, | Caustic Soda, 76° Tw. | |
| 0 — ½ | ,, | Turpentine Oil. | |

In dyeing with Pyrogene Blue no copper or brass should be allowed to enter into the construction of the dye-vessel, neither should the goods be exposed to the action of air during the dyeing operation.

Mechanical apparatus should therefore be worked by pumps, either hydraulic or steam driven, not driven by compressed air. In this way only the dye-liquor circulates through the goods, the entrance of air is impossible.

## Pyrogene Direct Blue, Red Shade and Green Shade.

Pyrogene Direct Blue red shade and green shade are dyestuffs of greater fastness to washing and light than Indigo and Indigo substitutes. Applied by very simple methods, without developing or after-treatment, they give DARK reddish and greenish indigo shades.

As already stated, the fastness of these colours to washing is excellent, and is exceeded by no other dyestuff; in respect of fastness to repeated severe washing (domestic) with soap and soda, indigo is not to be compared with them. Exposure to light for a period of three months in summer does not perceptibly alter the shade of this blue.

Their solubility and (for Sulphur dyestuffs) good level dyeing properties render them very suitable for apparatus dyeing.

On storing, cotton which has been dyed with Pyrogene Direct Blue, increases in beauty of shade; prolonged soaping serves only to improve the shade.

Dyeing with these colours is conducted according to the instructions already given for Pyrogene Blue R; the additions of caustic soda and turpentine oil are omitted, and the developing process is unnecessary, the goods being finished after wringing and washing.

The quantities of sodium sulphide given for Pyrogene Blue R are quite sufficient, but in order to ensure the greatest possible fastness to washing, it is advantageous to use rather more, as much as 1 lb. per 10 gallons liquor being used.

Usually 8 °/₀ dyestuff is sufficient for the first bath, and 6 °/₀ for a standing bath for the production of the deepest Indigo shades.

## Topping with Basic Dyestuffs and Indigo.

For bright shades, goods dyed with these dyestuffs are topped in a fresh bath with Basic dyestuffs, for which they have a great affinity. Pyrogene Direct Blue also possesses a great affinity for Indigo. By passing goods dyed with Pyrogene Direct Blue once through the Indigo vat, shades of equal depth are produced as those obtained by dyeing with Indigo alone in 5 or 6 dips.

This method finds general application in practice, and the dyeings so obtained exceed indigo in fastness.

As Topping Dyestuffs, the following are recommended :—

Methylene Blue G for pale and bright shades,

Fast Blue MD, New Blue RS and BS for dark shades.

These are applied in a fresh bath in quantities of 0·1—0·5 °/₀ with addition of ½ °/₀ alum or acetic acid.

By oxidation in warm damp air, or by developing with Eau de Javelle, &c., the shades produced with Pyrogene Direct Blue are rendered considerably brighter ; but as the fastness to washing is thereby greatly decreased, this method of application is not recommended.

# Pyrogene Brown G, 3 G, 5 G, B, D, M, R, V, and Pyrogene Cutch 2 G.

With the above dyestuffs all the different shades of brown may be produced, having the characteristic fastness of the Pyrogene colours; from the yellowest shade of brown (Pyrogene Cutch 2 G) to a grey brown (Pyrogene Brown D), and on the other side to a reddish shade of brown (Pyrogene Brown V).

Our Pyrogene Cutch 2 G is particularly worthy of attention on account of its fine golden brown shade and low cost.

All these dyestuffs are applied according to the usual instructions for Pyrogene colours, Method No. 6, and they are so little affected by air that the ordinary dyesticks may be used without danger.

The fastness to washing, as is the case with all Pyrogene colours, is excellent; interwoven white cotton is not stained even during the severest washing.

The fastness to light is hardly as good as that of Pyrogene Blue and Black, but this may be improved by after-treatment with

$$\begin{cases} 3\ \%\ \text{Copper Sulphate} \\ 3\ \text{,,}\ \text{Acetic Acid, } 12^\circ\ \text{Tw.} \end{cases}$$

at 60—80° C., without materially affecting the shade.

Like other Pyrogene colours, the Pyrogene Browns have the property of energetically fixing the Basic dyestuffs, and this circumstance is made use of in the production of deep and red catechu and other browns of good fastness, by topping the Pyrogene Brown dyed goods with suitable colouring matters. As particularly suitable dyestuffs for this purpose the following may be mentioned:—Patent Phosphine G, G G and R, and Russian Red, blue shade and yellow shade; in darker shades, Pyrogene Black or Pyrogene Direct Blue may be used in the same dyebath for shading purposes.

# Pyrogene Green B and Pyrogene Olive N.

The direct untreated dyeings produced with these colours possess the characteristic fastness to washing and milling of this class. The fastness to light is not so great as that of the blue and black dyestuffs.

These dyestuffs are applied according to Method No. 6, but it is worthy of note that Pyrogene Green B may be dyed without sodium sulphide, simply with soda alone, and in this way deeper shades are produced than by the ordinary method.

Pyrogene Olive N may be diazotised and developed with β-Naphthol, according to the method described for the Direct Cotton Dyestuffs, a reddish brown being produced, which is of good fastness to washing but of inferior fastness to light.

## Pyrogene Grey G, B and R.

These dyestuffs, applied in the manner usual for Pyrogene colours, give greenish, bluish and reddish shades of grey, which, besides being suitable for dyeing yarns for coloured woven goods, are particularly useful in the dyeing of linings, as they may be dyed on the padding machine in the way described for Pyrogene Blue R, giving level shades of good fastness to washing and acids (perspiration).

They may be after-treated with the metallic salts given for Pyrogene Black to increase the fastness, shaded in the same bath with other Pyrogene colours, and topped with Basic dyestuffs.

On account of their easy method of application and low cost they are extensively used for dying grey shades on linings, formerly produced with Sumac, iron and dyewood extracts.

## Pyrogene Yellow M.

Pyrogene Yellow M is the only yellow dyestuff on the market which produces dyeings perfectly fast to washing and milling on cotton without previous mordanting.

By after-treatment with bleaching powder solution 1—3° Tw. the original greenish yellow is changed into a fine orange yellow of very good fastness to washing and milling, which also possesses the property of being excellently fast to light, whereas the fastness to light of the direct dyeing is about equal to that of Pyrogene Olive.

This Orange Yellow, on account of its fastness to washing and bleaching, is of great importance in the production of coloured woven goods ; the yellow dyed cotton can be woven with unbleached yarn, and the operations of bleaching and after-treatment may then be carried out simultaneously.

By diazotising and developing with $\beta$-Naphthol a Bordeaux Red is obtained, which is fast to washing but of inferior fastness to light.

# Dyeing with Pyrogene Dyes

FOR LOOSE CO

The quantit

| | PYROGENE BLACK G, B, and GN. | | PYROGENE BLACK BD, GE, and BN. | | PYROG BLU R and |
|---|---|---|---|---|---|
| | First Bath. | Standing Bath. | First Bath. | Standing Bath. | First Bath. |
| **DYESTUFF** | 18—20 o/o | 10—12 o/o | 18—22 o/o | 10—13 o/o | 10—15 o/o |
| **SODIUM SULPHIDE** | 6—7 lbs. per 100 gls | 6—7 o/o | 8—10 lbs. per 100 gls | 7—9 o/o | 3—5 lbs. per 100 gls |
| **SOLVAY SODA** | 5 lbs. per 100 gls | 2 o/o | 5 lbs. per 100 gls | 2 o/o | 1—2 lbs. per 100 gls |
| **CAUSTIC SODA 75° TW.** | — | — | — | — | 1½—3 pints per 100 gls |
| **TURKEY RED OIL** For Cop Dyeing | — | — | — | — | 0—2 pints per 100 gls |
| **SALT OR CALCINED CLAUBER'S SALT** | 20—30 lbs. per 100 gls | 5—15 o/o | 20—30 lbs. per 100 gls | 5—15 o/o | 4—10 lbs. per 100 gls |

## Special Instructions for Cop-d

| | | | | | |
|---|---|---|---|---|---|
| **DYESTUFF** | 14—16 o/o | 9 o/o | 15—17 o/o | 9 o/o | 7—15 o/o |
| **SODIUM SULPHIDE** | 6—7 o/o | 4 o/o | 7—8 o/o | 5½ o/o | 8—11 o/o |
| **SOLVAY SODA** | 6—7 o/o | 3½ o/o | 6—7 o/o | 3½ o/o | — |
| **CAUSTIC SODA, 75° TW.** | — | — | — | — | 6—8 o/o |
| **TURKEY RED OIL** | 2 o/o | ½ o/o | 2 o/o | ½ o/o | 2 o/o |
| **CLAUBER'S SALT** | 10—12 o/o | 5 o/o | 8—9 o/o | 4 o/o | 3—10 o/o |

# lechanical Apparatus.

R AND COPS.

00 lbs. Cotton.

| ROGENE ECT BLUE d Shade and een Shade. | | PYROGENE BROWN, CUTCH 2 G, GREEN, OLIVE&YELLOW | | PYROGENE GREY. | | THIOPHENOL BLACK, T extra, 2 B extra, 2 R extra. | |
|---|---|---|---|---|---|---|---|
| st h. | Standing Bath. | First Bath. | Standing Bath. | First Bath. | Standing Bath. | First Bath. | Standing Bath. |
| o/o | 4—7 o/o | 8—16 o/o | 5—10 o/o | 2—5 o/o | 1—3 o/o | 10—16 o/o | 5—6 o/o |
| lbs.<br>0 gls | 6—9 o/o | 4—6 lbs.<br>per 100 gls | 3—5 o/o | 3—4 lbs.<br>per 100 gls | 1—2 o/o | 25—45 o/o | 8—12 o/o |
| lbs.<br>0 gls | 1—1½ o/o | 3—5 lbs.<br>per 100 gls | 2—3 o/o | 3—5 lbs.<br>per 100 gls | 1—2 o/o | 5 lbs.<br>per 100 gls | 2 o/o |
| | — | — | — | — | — | — | — |
| pints<br>0 gls | 0—½ o/o | — | — | 0—2 pints<br>per 100 gls | 0—½ o/o | 0—3 lbs.<br>per 100 gls | 0—½ o/o |
| lbs.<br>0 gls | 2—5 o/o | 10—20 lbs.<br>per 100 gls | 5—10 o/o | 10 lbs.<br>per 100 gls | 2—5 o/o | 40—50 lbs.<br>per 100 gls | 5—8 o/o |

## = 16—20 times Weight of Goods.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| o/o | 3—8 o/o | 7—15 o/o | 4—9 o/o | 2—5 o/o | 1—3 o/o | 10—15 lbs.<br>per 100 gls | 5—6 o/o |
| o/o | 6—9 o/o | 7—10 o/o | 2—4 o/o | 3—4 o/o | 2 o/o | 25—40 lbs.<br>per 100 gls | 8—12 o/o |
| o/o | 3 o/o | 6—7 o/o | 4 o/o | 3—5 o/o | 2½ o/o | 6—7 o/o | 2½ o/o |
| | — | — | — | — | — | — | — |
| 2 o | ½ o/o | 2 o/o | ½ o/o | 2 o/o | ½ o/o | 2 o/o | ½ o/o |
| o/o | 1—3 o/o | 6—8 o/o | 4 o/o | 5—6 o/o | 2½ o/o | 10—50 lbs.<br>per 100 gls | 6—15 o/o |

# The Basic Dyestuffs on Cotton.

## Method No. 7.

The cotton must be mordanted (tanned), and this is done with 2—7 °/₀ tannic acid, the amount being regulated according to the depth of the required shade (for duller shades ten times the amount of sumac extract may be used).

The well boiled yarn is entered into the mordanting bath at a temperature just below the boil, turned for ½—1 hour, then wholly immersed in the liquor and allowed to steep overnight in the cooling bath. The mordanted yarn is then fixed by working in a fresh lukewarm or cold bath containing an amount of tartar emetic or antimony salts corresponding to half the quantity of tanning matter employed ; after washing, the goods are dried, if not immediately dyed.

Piece goods are mordanted in a similar manner, or, particularly for printing purposes, on the hot flue or padding machine ; the goods are passed once or twice in the open width through a warm solution of 10—50 lbs. tannic acid per 100 gallons, dried, and then passed through a fresh warm bath containing 3—6 lbs. tartar emetic and 1—2 lbs. chalk per 100 gallons, after which they are well washed.

In mordanting, iron should be strictly avoided, as it produces stains and dulls the shade of the dyed goods.

These dyestuffs are most suitably dissolved in warm condensed water ; if, however, this cannot be obtained, and only hard water is available, the latter should be corrected by a slight addition of acetic acid.

The dyeing operation is conducted either in neutral bath or with addition of acetic acid or alum.

The goods are worked in the cold bath until the major portion of the dyestuff is taken up, then the temperature of the bath is gradually raised to the boiling point. Auramine II, O and G should not be heated above 70° C.

### After-treatment of Dyed Goods with Tannic Acid.

The fastness to washing of the colours obtained with most dyestuffs may be considerably increased, by passing the goods after dyeing, once more through the baths of tannic acid and tartar emetic.

## Dyeing on Turkey Red Oil and Alum Mordant.

**Method No. 8.** (Particularly useful for bright shades with Rhodamine).

The yarn is passed through a 10 °/₀ solution of turkey red oil, dried and passed through aluminium acetate 10—12° Tw. It is then dried, and both operations are repeated two or three times, according to the depth of shade required. The turkey red oil may be replaced by a solution of soap.

Rhodamine S is often dyed with addition of 1—2 lbs. acetic acid per 100 gallons, without mordanting. This method is applied for the production of pink shades.

Many dyestuffs, particularly Pure Blue and Water Blue, are often dyed on alum mordant, the goods being prepared as follows :—The yarn is worked for half an hour in a $\frac{1}{2}$—1 °/₀ solution of alum just below the boil ; the aluminium is fixed by working in a weak ($\frac{1}{10}$ °/₀) soda bath lukewarm.

Both methods give very brilliant dyeings, which are not very fast to washing.

Also with addition of—

{2 °/₀ Stannate of Soda.
{1 °/₀ Sulphuric Acid, 168° Tw.

the various brands of Water Blue, when dyed and dried without washing, give bright shades of inferior fastness to washing.

Certain basic dyestuffs, particularly the Victoria Blues, may be applied in the following manner. The shades produced are, however, not so fast as those dyed on tannin mordant. In the same way the various brands of Pure Blue may also be applied :—

## Method No. 9.

The goods are entered into the dyebath containing 10—15 times the weight of the goods of water with addition of 1—2 °/₀ aluminium sulphate or 2—4 °/₀ alum, the bath being hot or boiling at the beginning of the operation. The goods are worked for some time in the cooling bath ; they are afterwards wrung out and dried without washing.

# Tables showing the Fastness of the Basic Dyestuffs.

B

| NAME OF DYESTUFF. | Method of Dyeing. | Solubility. | FASTNES | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | Ac |
| **Auramine O O**<br>**O**<br>**II** | On cotton Method No. 7.<br>On wool Method No. 15 and No. 16. | Very good. Must not be heated above 70° C. | III. | Fairly good. | Mod |
| **Auramine G** | As Auramine O. | Very good. Must not be heated above 70° C. | II—III. Rather better than Auramine O. | Fairly good. | Mod |
| **Patent Phosphine G G**<br>**G**<br>**R**<br>**M** | On cotton Method No. 7.<br>On wool and silk, little used. | Good. | II—III. Particularly good on leather. | Good. Do not bleed into wool or cotton when treated with alkaline soap solution for ½ hour at 50° C. | Exce Becc little on t ment dil min ac |

## stuffs.

| WARDS | | | Behaviour towards discharging agents. | Other Properties. Remarks. |
|---|---|---|---|---|
| es. | Chlorine. | Ironing. | | |
| ood. | Poor. | Good. | May be discharged with caustic alkali, with alkaline sulphite and with oxidation discharges. Withstands neutral sulphite and is suitable for discharges on Aniline Black. | On account of their pure clear shade much used for yellow, also in mixtures for green and red. Useful for printing and discharging. Suitable, on account of their fastness to stoving, for dyeing wool (zephyr yarn) in soap bath. Of interest for leather and paper dyeing, the production of lakes and dyeing of half-silk, jute and cocoanut fibre. |
| od. | Poor. | Good. | As AuramineO. Withstands also a strong zinc dust discharge. | As the finest green shade of yellow on the market, much liked in mixtures with green. Further properties and application as Auramine O. |
| . | Excellent. Are not bleached by steeping in bleaching liquor, 2° Tw. for $\frac{1}{4}$ hour. | Good. | Withstand tin crystals and zinc dust discharges, and may be used with these for coloured discharges. Are discharged fairly well with oxidation discharges. | The chief application of these dyes is in leather dyeing, in which industry they are largely employed on account of their level dyeing properties and low cost.<br>Applicable to cotton, jute and straw.<br>Patent Phosphine M, the darkest brand, is particularly useful for printing purposes. |

## B

| NAME OF DYESTUFF. | Method of Dyeing. | Solubility. | FASTNE | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | Ac |
| **BRILLIANT PHOSPHINE 5 G**<br>**3 G**<br>**G** | On cotton Method No. 7.<br>On wool Method No. 15 and No. 16.<br>On silk Method No. 25.<br>On weighted silk in acid bath containing boiled off liquor. | Good. Stands boiling. | II—III. | Good.<br>On washing with alkaline soap solution, does not bleed into wool or cotton. | Very<br>With<br>1<br>sulp<br>ac |
| **XANTHINE** | On cotton Method No. 7. | Not so good as Patent Phosphine. | II—III.<br>On leather excellent. | Poorer than Brilliant and Patent Phosphine. | D<br>mi<br>a<br>tur<br>shad |

## stuffs.

| WARDS. | | | Behaviour towards discharging agents. | Other Properties. Remarks. |
|---|---|---|---|---|
| lies. | Chlorine. | Ironing. | | |
| good. | Colour destroyed. | Good. | Give a good white on tannin ground discharged with caustic alkali.<br>Are discharged fairly well by oxidation discharges, also with neutral sulphite.<br>May also be mixed with neutral sulphite for coloured discharges as well as with zinc dust and tin crystals discharges. | In consequence of their clear shades ranging from yellow to orange, much used in cotton dyeing, also in mixtures with Safranine and Rhodamine.<br>Suitable for printing and discharging on cotton and silk. Find application in the dyeing of stoved shades on zephyr yarn being fast to stoving, and in addition are used in silk dyeing, also for leather, jute and straw. |
| ent. | Colour destroyed. | Good. | Little used for discharging | Principally used in leather dyeing. |

B

| NAME OF DYESTUFF. | Method of Dyeing. | Solubility. | FASTNE | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | A |
| **CHRYSOIDINE G**<br>**R**<br>**BISMARK BROWN G**<br>**R** | On cotton Method No 7.<br>On wool Method No. 15.<br>On silk Method No. 25. | Good. Should not be dissolved too hot. | III. | Poor. | Mo |
| **COTTON SCARLET G**<br>**CARDINAL RED G** | On cotton Method No. 7. | Good. | II—III. | Fairly good. | Fa go |
| **SAFRANINE G 000**<br>**B 000** | On cotton Method No. 7.<br>On silk Method No. 25.<br>On half-silk Method No. 29. | Very good. | II—III. | Excellent. | G Tı blu str ac |

## stuffs.

| VARDS | | | Behaviour towards discharging agents. | Other Properties. Remarks. |
|---|---|---|---|---|
| es. | Chlorine. | Ironing. | | |
| ate. | Colour destroyed. | Good. | Not much used for discharging. Give shades from drab to yellowish brown with zinc acetate or aniline black. | For cheap mode shades on cotton, for topping catechu, Direct and Pyrogene dyestuffs, and for jute and leather. Chrysoïdine is also used in mixtures with Safranine for dull orange shades.<br>For printing only in mixtures, as alone they are not sufficiently fast. Of little importance for wool and silk. |
| . | Colour destroyed. | Good. | Not suitable for discharging. | Principally used for cotton dyeing. |
| . | Colour destroyed. The fastness is sufficient for printing purposes. | Good. | Not fully dischargeable with caustic soda. Do not give a pure white on discharged tannin ground. Not discharged by oxidation and sulphite discharges. May be mixed with zinc dust, tin crystals and potassium sulphite discharges. Suitable also for reserve under Aniline Black. | Much used in cotton and half-silk dyeing and printing on account of their fastness to light and washing. Suitable for dyeing jute, cocoanut fibre and paper, also for the manufacture of spirit varnishes, writing inks, wall paper and similar purposes. |

| NAME OF DYESTUFF. | Method of Dyeing. | Solubility. | FASTNE | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | A |
| **RHODAMINE 6 G**<br>**6 G EXTRA**<br>6 G Extra is 5 times the strength of 6 G. | On cotton Method No. 7, less often Method No. 8.<br>On wool Method No. 15 and No. 16.<br>On silk in slightly acid boiled off liquor bath.<br>For pale pinks on bleached cotton direct in weak acetic acid bath luke-warm. | Very good. | II—III. considerably better than Eosine. | Very good. | G<br>Wit<br>the a<br>1<br>sul<br>a |
| **RHODAMINE G & G EXTRA**<br>**B & B ,,**<br>**3 B & 3 B ,,**<br>The "extra" brands are 5 times (3 B only 4 times) the strength of the ordinary brands. | On cotton Method No. 7.<br>For bright shades also Method No. 8.<br>On wool Method No. 15 and No. 16.<br>On silk Method No. 25. | Very good. | II—III. | Very good. | C |

## stuffs.

| WARDS | | | Behaviour towards discharging agents. | Other Properties. Remarks. |
|---|---|---|---|---|
| ies. | Chlorine. | Ironing. | | |
| d. | Colour destroyed. Fast enough, however, for printing purposes. | Good. | Dischargeable with caustic soda and in very pale shades with oxidation discharge.<br>Give a good white on discharged tannin ground.<br>Useful as an addition to neutral sulphite, tin crystals, or oxidation discharges, in the last case with tannin, or as an insoluble lake.<br>Gives a fine pink under Aniline Black, and as a reserve under Paranitraniline Red. | The finest dyestuff on the market for reds. Used in mixtures with Auramine or Brilliant Phosphine for scarlet shades fast to light and washing.<br>Of considerable importance for direct printing on cotton, silk and half-silk, for discharges and in the manufacture of lakes.<br>Gives a beautiful fluorescence on silk. |
| l. | Becomes decidedly paler. | Good. | Discharged by caustic soda, and in pale shades with oxidation discharges.<br>Give a good white on discharged tannin ground.<br>The B mark is also applicable for tin crystals and potassium sulphite discharges. | Give very fine dyeings on cotton upon oil (particularly B and G) and tannin mordants.<br>Very suitable (particularly B and G) for the dyeing and printing of wool and silk, either alone or in mixtures with acid dyestuffs.<br>3 B is chiefly used for silk, also for weighted silk.<br>G and B are used also for cotton and half-silk printing, fixed with tannin or acetate of chrome. |

## Ba

| NAME OF DYESTUFF | Method of Dyeing. | Solubility. | FASTNESS | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | Acid |
| **RHODAMINE S AND S EXTRA** | On cotton generally direct, with addition of acetic acid, more seldom by Method No. 7. | Very good. | III. | On tannin mordant good. | Good |
| **DIAMOND MAGENTA** (Large and small crystals.)<br>**CERISE**<br>**JUTE RED, YELLOW SHADE AND BLUE SHADE** | On cotton Method No. 7. On wool Method No. 15. On silk Method No. 25. | Very good. | III—IV. | On cotton poor. Magenta on wool good. | Gooc again weak ac |
| **VIOLET 3 R**<br>**2 R**<br>**R**<br>**B**<br>**2 B**<br>**3 B**<br>**4 B** | On cotton Method No. 7. On wool Method No. 15. On silk Method No. 25. | Very good. | III—IV. | On cotton moderate. On wool good. | Strong a chang thes colours green |

## stuffs.

| WARDS | | | Behaviour towards discharging agents. | Other Properties. Remarks. |
|---|---|---|---|---|
| ies. | Chlorine. | Ironing. | | |
| d. | Colour destroyed. | Good. | Little used for discharging | Mostly used for bright pinks on cotton, dyed with addition of acetic acid. Often used for topping direct pinks, or in one bath with direct dyes fast to acid (Direct Pink, Chlorantine Red and Pink, Direct Safranine), also for half-silk. For printing cotton and half-silk with addition of tannin or acetate of chrome. |
| r. | Colour destroyed. | Good. | Only Magenta is generally used for discharging. Is discharged by caustic soda, oxidation and alkaline sulphite discharges; gives a good white on discharged tannin ground. Not discharged by tin crystals. | Finds application in cotton and wool dyeing (for hosiery yarn), and is used for topping direct and Pyrogene dyestuffs and catechu. In Printing Magenta and Cerise (this is duller than the former) are used alone and in mixtures for shading colours obtained with the dyewoods and catechu.<br>Jute red is used principally in leather dyeing. |
| ient. | Colour destroyed. | Good. | Dischargeable with caustic soda, alkaline sulphite, and oxidation discharges. Gives a good white on discharged tannin ground. Useful in tin crystals discharges. | Used for dyeing and printing cotton, half-silk and jute; for leather, paper, manufacture of inks and lakes.<br>Suitable for dyeing low-class woollen goods, especially shoddy. |

## Ba

| NAME OF DYESTUFF. | Method of Dyeing. | Solubility. | FASTNES | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | Aci |
| **CRYSTAL VIOLET 5 B O**<br>**ETHYL VIOLET** | As Violet 3 R—4 B. | Very good. | Ethyl Violet III—IV. Crystal Violet 5 BO, better, II—III. | On cotton moderate. On wool excellent. | Fairly |
| **SODA VIOLET** | On cotton Method No. 7. | Good. It is advantageous to mix the dyestuff with a little acetic acid and afterwards to pour on boiling water. | II—III. | Very good. | Fairly |
| **BRILLIANT VIOLET 6 B**<br>**8 B** | On cotton Method No. 7. On wool Method No. 15 and No. 16. On silk Method No. 25. | Good. Should be mixed with acetic acid. | III. | Fairly good. On wool fast to milling. | Fairly 10 sulph acid t the sh pale |

## stuffs.

| OWARDS | | | Behaviour towards discharging agents. | Other Properties. Remarks. |
|---|---|---|---|---|
| lies. | Chlorine. | Ironing. | | |
| od. | Colour destroyed. | Good. | As Violet. | Application as Violet.<br>Often preferred on account of its pure blue shade and excellent solubility. |
| good. | Poor. | Good. | Dischargeable with oxidation discharge. | Chiefly used for cotton dyeing and printing, on account of its superior fastness to washing. It withstands alkaline washing. |
| rate. | Poor. | Good. | Behave like the various brands of Victoria Blue. | Are distinguished amongst the Basic Violets for their remarkable blue shade and low cost.<br>They are extensively employed in the dyeing of cotton, wool, silk, half-silk, half-wool, shoddy, paper and in printing the same goods.<br>They are fast to stoving, and are suitable, therefore for dyeing Zephyr yarns. |

## Ba

| NAME OF DYESTUFF. | Method of Dyeing. | Solubility. | FASTNES | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | Aci |
| **VICTORIA BLUE 4 R**<br>**R**<br>**B**<br>**B S**<br>**NIGHT BLUE** | On cotton Method No. 7 and No. 9. On wool Method No. 15 and No. 16. On silk Method No. 25. Victoria Blue R is dyed on wool in neutral or weak acid bath, the others in strong acid bath. | Good. Make into a paste with acetic acid and pour on hot water. | III—IV. | Good. In alkaline soap bath bleeds only slightly into the white. On wool fast to milling. 4 R is the fastest, B rather less fast, and R is between these two. | Go |
| **BRILLIANT VICTORIA BLUE R B**<br>**NEW VICTORIA BLUE G G** | As Victoria Blue 4R—B. New Victoria Blue G G is used principally for cotton and silk. | Good. Brilliant Victoria Blue R B very good. Dissolves without addition of acetic acid. | III—IV. | Good. Brilliant Victoria Blue R B is better on wool than Victoria Blue B. | Go<br>Not good |

# estuffs.

| OWARDS | | | Behaviour towards discharging agents. | Other Properties.<br>Remarks. |
|---|---|---|---|---|
| alies. | Chlorine. | Ironing. | | |
| lerate. | Colour destroyed. | Good. | Victoria Blue B is discharged with difficulty by caustic soda, but very easily with oxidation discharges. May be added to sulphite discharges. Do not give a white on caustic discharged tannin ground. | On account of their beautiful shades and low cost, these colours find extensive application in the dyeing and printing (with tannin and chromium acetate) of cotton, silk and wool, both loose and in the form of yarn, shoddy, half-wool, straw, jute, and cocoanut fibre yarn Useful for weighted silk.<br>In consequence of their fastness to stoving much used for dyeing zephyr yarns.<br>Victoria Blue R is particularly useful for shoddy (dyeing in neutral bath).<br>Night Blue is remarkable for its singularly pure clear shade, which it retains in artificial light, and is used chiefly for silk. |
| erate. | Colour destroyed. | Good. | As Victoria Blue 4 R—B. | Application similar to the above brands.<br>Particular advantages: R B gives very pure blue shades. New Victoria Blue G G gives pure greenish blue shades, also the very good solubility of R B. |

B

| NAME OF DYESTUFF. | Method of Dyeing. | Solubility. | FASTNES | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | Ac |
| METHYLENE BLUE G<br>G CONC.<br>D<br>D CONC.<br>3 R<br>2 R<br>R<br>B<br>B B<br>R<br>R N CONC.<br>R N D<br>R N D CONC. | On cotton Method No. 7, for very dark navy blues on tannin and iron mordant. Not applicable to wool. On silk alone Method No. 25. Generally used for topping Logwood Black on silk. | Good. Methylene Blue D very good. | I. The redder brands. I—II. | Very good. | Go |
| NEW BLUE R S<br>FAST BLUE M D<br>M B | On cotton Method No. 7. Scarcely ever used for wool and silk. | Fairly good Mix with acetic acid or hydrochloric acid and pour on hot water. New Blue RS dissolves in water alone. | I—II. | Good. Fast Blue MD is fairly fast to milling. RS is less fast. | Go |

# stuffs.

| WARDS. | | | Behaviour towards discharging agents. | Other Properties. Remarks. |
|---|---|---|---|---|
| lies. | Chlorine. | Ironing. | | |
| d. | Good. Important for calico-printing. | Good. | Give a fair white with caustic, also with alkaline sulphite. Unsuitable for oxidation discharges. On caustic discharged tannin ground give a good white only in mixtures. Withstand zinc dust and tin crystals. Useful for reserves under Aniline Black. | May be classed, on account of their fastness to washing and light, amongst the most useful dyes for cotton. Applicable for topping purposes (Direct and Pyrogen dyestuffs, Logwood black, etc.), leather, paper, jute, and manufacture of lakes (fast to lime). For printing on cotton and half-wool only, the D brand (which contains no zinc) is used in large quantities. |
| good. | Poor. | Good. | Give a good white on caustic discharged tannin bottom, and can also be discharged with sulphite and chlorate of soda. | Used mostly for dyeing and printing cotton goods.<br>For printing, it is recommended to make a small addition of chlorate of soda, and steam without pressure.<br>New Blue RS is used in mixtures as a darkening dyestuff for leather. Applicable also as a topping dyestuff for Pyrogene dyes. |

| NAME OF DYESTUFF. | Method of Dyeing. | Solubility. | FASTNE | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | A |
| **BRILLIANT GLACIER BLUE** | On cotton Method No. 7.<br>On wool Method No. 15 and No. 16.<br>On silk Method No. 25.<br>On weighted silk in sulphuric acid bath containing boiled off liquor. | Good. Mix with acetic acid and pour on hot water. | III. On silk rather better. | Good. On silk very good, fast to water and washing. | Moc |
| **NEW FAST GREEN 2 B**<br>**3 B** | On cotton Method No. 7.<br>On wool very little used.<br>On silk Method No. 25. | Good. 2 B is not quite so easily soluble as 3 B. | III. On silk rather better. | Good. On silk very good, fast to water and washing. | Mod |

## stuffs.

| WARDS. | | | Behaviour towards discharging agents. | Other Properties. Remarks. |
|---|---|---|---|---|
| lies. | Chlorine. | Ironing. | | |
| od. | Poor. | Good. | Is discharged by caustic, alkaline sulphite, and above all with oxidation discharges. Gives a good white on discharged tannin ground, and may be mixed with tin crystals discharges. Gives fine blue reserves under Aniline Black. | The purest green shade of blue on the market.<br>Much used for cotton and silk dyeing, for weighted silk, and particularly for cotton and half-silk printing and discharging (with oxidation discharges). Useful also for the manufacture of lakes and the printing of wall paper. |
| od. | Poor. | Good. | As Brilliant Glacier Blue. | Dyestuffs giving pure bluish green shades.<br>Principally used for dyeing cotton and silk, also for the printing and discharging of cotton, silk and half-silk. |

B

| NAME OF DYESTUFF. | Method of Dyeing. | Solubility. | FASTNE | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | Ac |
| **FAST GREEN O, I**<br>**J J O**<br>**B B I** | On cotton Method No. 7.<br>On wool Method No. 15.<br>On silk Method No. 25. | Very good. | III. | Excellent. | Mod |
| **JUTE BLACK N, V, C N**<br>**STRAW BLACK 5093**<br>(Also for jute and paper.)<br>**LEATHER BLACK I, C I**<br>**C 2, C 3**<br>**PAPER BLACK C N, N**<br>**V, S, 5093, 3891** | On cotton Method No. 7.<br>On wool scarcely ever used, and seldom for silk. If used, Method No. 25.<br>Jute and straw in neutral bath | Good. | II. | Moderate. | Pc |

## stuffs.

| WARDS | | | Behaviour towards discharging agents. | Other Properties. Remarks. |
|---|---|---|---|---|
| ies. | Chlorine. | Ironing. | | |
| r. | Poor. | Good. | Give a good white with caustic, sulphite and oxidation-discharges. Also on discharged tannin ground. May be mixed with tin crystals discharges. | Find extensive application in cotton dyeing, and in the printing of cotton and half silk.<br>Exceedingly useful for jute, ramie, paper, leather, and for the manufacture of lakes, and similar purposes. |
| r. | Colour destroyed. | Good. | Paper black GN gives fairly good results with oxidation-discharges. | These dyestuffs, which are also applicable to cotton and silk, are, however, mostly used for those purposes which are indicated by their several names.<br>They can be advantageously substituted for logwood in the dyeing of the various textile materials referred to. |

## The Acid Dyestuffs on Cotton.

On account of their inferior fastness to washing and water, these dyestuffs are seldom applied to cotton; only for particularly brilliant shades, where fastness is of minor importance, are they occasionally employed, and then according to the following recipes :—

**Method No. 10.** (Particularly suitable for Ponceau, Paper Red PSNR and Orange II.)

Dye with addition of

20—30 % Alum, or 10—20 % Aluminium Sulphate,
20—30 ,, Glauber's Salt

at 70—80°, wring and dry without washing.

The following method also finds application in the production of particularly bright shades :—

### Method No. 11.

The goods are worked ½ hour in a bath of stannate of soda, 3° Tw., totally submerged for 3 or 4 hours, wrung out, and treated for about an hour in a bath containing—

20 lbs. Alum } per 100 gallons water.
3 lbs. Solvay Soda }

wrung out and dyed in a fresh concentrated bath with the acid dyestuff.

The goods are entered at 60° C., worked ¾ hour in the cooling bath, wrung out, and dried at a low temperature.

The baths may be used again after bringing up to the original strength.

The Resorcine (Eosine) Dyestuffs are dyed as follows :—

## Method No. 12.

A very concentrated dyebath is employed (10 times the weight of the goods) with the addition of 50 lbs. salt per 100 gallons. The goods are entered at a temperature of 40—50° C., and worked $\frac{3}{4}$ hour in the cooling bath. They are then wrung out or hydro-extracted, and dried in the open air without washing.

The bath is replenished and used for further operations.

## The Mordant Dyestuffs on Cotton.

The Mordant dyestuffs suitable for cotton, which, in the case of our products, are confined to the various brands of Gallocyanine, are dyed on cotton mordanted with chrome (or occasionally with other metallic oxides).

In spite of their excellent fastness, these dyeings are seldom used for self colours, but are more often employed for discharge or reserve printing.

One method of using this kind of dyestuff is as follows :—

### Method No. 13.

Steep overnight in a cold bath of

2 parts Chromium Acetate, 28° Tw.
6 ,, water
2 ,, Caustic Soda, 76° Tw.

Wash well, and dye with—

10—20 % Gallocyanine paste (1—2 % powder) with addition of 2—3 % acetic acid 12° Tw. Enter cold, raise to boil in 1 hour and boil 1 hour.

# DYESTUFFS FOR COTTON.

## ARRANGED ACCORDING TO FASTNESS AND APPLICATION.

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### Dyestuffs for Apparatus Dyeing (specially suitable for Cops.) Easily Soluble and very Level Dyeing.

Chlorantine Yellow JJ, JG
,, ,, T
Cotton Yellow CH
Fast Yellow R 1209
Chlorantine Orange TR
,, ,, TRR
Direct Orange R
Chlorantine Brown R
Direct Brown R 1804
Cupranil Brown R, G, B
Direct Brown M 617
Chlorantine Red 4 B, 8 B
Acid Congo R
Direct Safranine G, B
Direct Pink GN
,, ,, BN
Chlorantine Pink
Cotton Red D
Chlorantine Violet R, B
Chlorantine Lilac B, BB, R
Tolamine Violet 2422
Direct Blue BX, 2 B, 3 B

Acetylene Blue 3 R, BX
,, ,, 3 B, 6 B
Acetylene Pure Blue
Acetylene Sky Blue
Direct Light Blue 550
Direct Sky Blue green shade
Direct Indigo Blue A, BN
,, ,, ,, BNK
Cotton Blue N, R
Indigen Blue BB, B, R
Direct Green B 695 } Dissolve without Soda.
,, ,, G }
Indigen Black B
Melantherine HW, BH, JH
,, BO, RO
Carbide Black S, E
Neropaline P
Direct Black 1602, 1718
The various Pyrogene Colours
and
Thiophenol Blacks

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## Dyestuffs which are rendered Fast to Water by After-treatment with Aluminium Salts.

*Fast Yellow R 1209
*Direct Yellow 1704
,, ,, CR
,, ,, 2192
Direct Orange G
*Direct Brown 1655
,, ,, JJ
,, ,, P
,, ,, 1659
,, ,, R 1804
Chlorantine Brown R
,, ,, B
*Cupranil Brown R
,, ,, G
,, ,, B
*Direct Violet CB
,, ,, N 582
*Tolamine Violet 2422
*Chlorantine Violet B
,, ,, R
*Chlorantine Lilac B, BB, R
Cotton Red 12 B
,, ,, 11 B
* ,, ,, 10 B
* ,, ,, 6 B
*Cotton Red 5 B
* ,, ,, B
Acid Congo R 1573
*Direct Safranine B
* ,, ,, G
Chlorantine Red 4 B
,, ,, 8 B
Chlorantine Bordeaux B
Chlorantine Blue BB
*Cotton Blue R
*Direct Blue B
* ,, ,, R
Neropaline P
*Opaline 2 G
Direct Green J
,, ,, B 695
*Tolamine Green 2040
*Carbide Black E
,, ,, S
Direct Black C R
,, ,, 1602
,, ,, 1718
,, ,, 1632
Direct Grey B
,, ,, R

Those colours marked with an asterisk (*) bleed a little into white cotton when steeped in warm water.

## Direct Dyestuffs suitable for Cold Dyeing.

Fast Yellow R 1209
Cotton Yellow CH
Direct Yellow T
,, ,, TO
Direct Orange G
,, ,, R
Direct Pink BN 369
,, ,, GN 403
Chlorantine Lilac B
Chlorantine Brown R }
,, ,, B } fairly good
,, ,, BB }
Acetylene Blue 6 B
Acetylene Pure Blue
Acetylene Blue 3R
Direct Safranine B 1687 } up to 2%
,, ,, G 1688 }
Melantherine BH 678
,, JH

These are applied in cold or lukewarm bath, with the addition of

10—15 lbs. Glauber's Salt } per 100 gallons
1—1½ lbs. Soda }

# Cotton Dyestuffs Fast to Washing.

The following cotton dyestuffs do not bleed into white cotton on washing with neutral soap :—

(1) The various basic dyestuffs, after-treated with tannic acid and tartar emetic.

The following bleed a little :—

Rhodamine S, B, G
Fast Green O, JJO
Victoria Blue B
Brilliant Victoria Blue RB
New Victoria Blue GG
Chrysoidine G, R
Bismark Brown G, R

(2) The various Pyrogene colours (fast to milling)
Rosanthrene O, R, A, B, CB (developed)

(3) Melantherine BH, HW, JH (developed)
Neropaline P (developed)
Cupranil Brown B, G, R (with copper)
Direct Yellow CR (with bichromate and copper sulphate)
Direct Brown M, V (developed)
Nitranil Brown various brands (with p-nitraniline)
Indigene Blue B, BB, R (developed)
Direct Sky Blue green shade (with copper)
Acetylene Sky Blue (with copper)

As comparatively fast may be mentioned :—

Chlorantine Yellow JJ
,, ,, JG
Fast Yellow R 1209
Direct Yellow T
Chlorantine Orange TR
,, ,, TRR
Chlorantine Pink
Chlorantine Lilac B
,, ,, BB
,, ,, R
Direct Blue 2 B 548
Chlorantine Blue B
,, ,, BB
Direct Indigo Blue A
Direct Brown J
,, ,, JJ
,, ,, 1655
,, ,, 1804
Cupranil Brown B
Direct Black 1718
Direct Grey G

# Fastness towards hot or boiling Size.

## Basic Dyestuffs.

*Auramine O, II
Brilliant Phosphine G, 3 G, 5 G
Patent Phosphine GG, G, M
Safranine G 000, B 000
*Rhodamine 6 G, B, 3 B
*Violet 2 B, 3 B
*Crystal Violet 5 BO
*Ethyl Violet
Brilliant Violet 6 B, 8 B
Methylene Blue G
*New Blue RS
Victoria Blue B
*Fast Blue MD
*Victoria Blue R, 4 R
*Brilliant Victoria Blue RB
New Fast Green 2 B, 3 B
Fast Green JJO, O

The fastness to sizing of the above dyestuffs is considerably increased by after-treating with tannic acid and tartar emetic. Those colours marked with an asterisk * are particularly fast to sizing.

## Direct and Pyrogene Dyestuffs.

The various Pyrogen colours and Thiophenol blacks
Rosanthrene O, R, A, B, CB (developed)
Direct Yellow CR (with bichrome or chrome alum)
Melantherine BH, HW, JH (developed)
Neropaline P (developed)
Cupranil Brown B, G, R (with copper sulphate)
Direct Sky Blue, green shade (with copper)
Acetylene Sky Blue (with copper)
Direct Brown M, V (developed)
Direct Pink BN, GN (for pale shades)
Direct Green B 695 (with chrome alum)

Most direct dyestuffs, which are rendered fast to water by an after-treatment with aluminium salts, also withstand the action of warm size (at 50—60° C).

## Cotton Dyestuffs which, when woven with wool, withstand cross-dyeing in boiling acid bath.

Auramine II
,, O
,, G
Pyrogene Yellow M (direct and treated with chlorine)
Patent Phosphine M
,, ,, G
,, ,, GG
,, ,, R
Brilliant Phosphine 5 G—G
Rosanthrene C B (developed)
Direct Brown M
,, ,, V
Pyrogene Brown G
,, ,, 3 G
,, ,, 5 G
,, ,, B
,, ,, D
,, ,, M
,, ,, R
,, ,, V
Pyrogene Cutch 2 G
Nitranil Brown (various brands)
Safranine G 000
,, B 000

Rhodamine 6 G, B
,, 5 G
,, 3 B
,, S
Methylene Blue G
New Blue RS
Pyrogene Blue R and RR
Pyrogene Direct Blue, red shade and green shade
Indigene Blue B
,, ,, BB
,, ,, R
Victoria Blue (various brands)
Melantherine HW
,, BH
Neropaline P
Indigene Black B, BB
Pyrogene Black
Thiophenol Black } Various Brands
Fast Green O
,, ,, JJO
,, ,, I
New Fast Green 2 B
,, ,, ,, 3 B

The Direct Dyestuffs diazotised and developed (or after-treated with diazotised paranitaniline).

The Basic Dyestuffs after-treated with tannic acid and tartar emetic.

# The Dyeing of Mercerised Cotton.

## The Dyeing of Mercerised Cotton.

The dyeing of mercerised cotton is generally carried out in the same way as that of ordinary cotton, but the former usually requires rather less dyestuff; on the average only $\frac{4}{5}$ of the amount of dyestuff necessary for unmercerised cotton is required to produce the same depth of shade on mercerised goods. A smaller amount of tannic acid is required for mordanting mercerised goods when dyeing with basic colours.

In dyeing with direct cotton colours and Pyrogene colours, the quantity of Glauber's salt or common salt is reduced by $\frac{2}{3}$—$\frac{1}{2}$; better results are obtained on mercerised cotton goods by replacing the addition of soda by an addition of some weaker alkali, such as soap, sodium phosphate, borax, &c. (in quantities of 2—4 lbs. per 100 gallons). The presence of Turkey Red Oil in the dyebath exerts a beneficial effect on the evenness and brilliancy of the shades obtained.

The much desired "scroopy" handle may be imparted to mercerised yarn by first working in a dilute soap bath (soap may be added direct to the dyebath), and after wringing out, passing through a dilute bath of acetic acid. The goods are dried without washing. An increased effect is obtained by using calcium acetate in the second bath instead of acetic acid.

# The Dyeing of Linen, Hemp, and Ramie (China-grass).

# The Dyeing of Linen, Hemp, and Ramie (China-grass).

These fibres, as far as their dyeing properties are concerned, behave very similarly to cotton; Ramie most nearly approaches cotton in its properties, whereas linen and hemp being coarser fibres are more difficult to dye thoroughly through. On this account, when dyeing with direct and Pyrogene dyestuffs, the temperature of the dyebath should be raised gradually, in order to obtain perfect penetration of the fibre. It is also advisable to commence dyeing without the addition of common salt or Glauber's salt, such addition being made later, towards the end of the dyeing operation. The presence of soap in the dyebath causes the direct dyestuffs to exhaust more slowly.

Preliminary to dyeing any of these fibres, a thorough boiling with soda is recommended.

When mordanting with tannin, the bath should be as hot as possible in order that the mordant may penetrate to the centre of the fibre.

In other cases, the methods commonly employed for cotton are available for these fibres.

# The Dyeing of Jute and Cocoanut Fibre.

# The Dyeing of Jute and Cocoanut Fibre.

Direct dyestuffs are dyed with addition of 10—20 % calcined Glauber's salt or common salt.

Pyrogene dyestuffs are very little used for these fibres; they may, however, be applied by following the instructions given for cotton.

Basic dyestuffs are most frequently employed on account of their low cost; the fastness and penetrating powers of these colouring matters are inferior to those of the acid dyestuffs.

The goods are entered into the dyebath at a temperature of 60—70° C., dyed ¾ hour in the cooling bath, wrung out, and dried.

Rhodamine B has been found to be particularly useful for the production of pink shades.

Acid dyestuffs are much faster to light and penetrate the fibre better. They are also fast to oil (withstanding the oil softening process which is employed for jute), and for these reasons are often used in the dyeing of jute and cocoanut fibre.

The acid dyestuffs are applied with addition of 1—3 % alum, and are otherwise dyed in the same way as the basic colours.

Eosine dyestuffs are applied to these fibres in the same way as recommended for cotton, *viz.*, with addition of 20—40 % common salt, calculated on the weight of the goods, at a temperature of 35—40° C.

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# Dyestuffs for Jute.

Auramine O.
,, II.
,, G.
Patent Phosphine G.
,, ,, GG.
,, ,, M.
Azo Yellow I.
,, ,, O.
Orange MNO
,, II.
,, R.
Chrysoidine G.
,, R.
Jute Scarlet B.
,, ,, 4 R.
,, ,, G.
Rocceline.
Paper Red PSN.
,, ,, PE.
Russian Red, yellow shade
,, ,, blue shade
Chlorantine Red 4 B.
,, ,, 8 B.
Rhodamine S.
Safranine G 000.
,, B 000.
Diamond Magenta.
Violet 3 R—3 B.
Crystal Violet 5 BO.
Brilliant Violet 6 B.
,, ,, 8 B.
New Blue RS.
Victoria Blue 4 R.
,, ,, R.
,, ,, B.
Pure Blue A 1.
,, ,, AR 1.
,, ,, BS 1.
Water Blue C III.
Brilliant Victoria Blue RB
New Victoria Blue GG.
Brilliant Glacier Blue.
Fast Green JJI.
,, ,, FII.
,, ,, I.
,, ,, BBI.
Chlorantine Brown R.
,, ,, B.
,, ,, BB.
Cupranil Brown G.
,, ,, R.
,, ,, B.
Jute Black N.
,, ,, GN.
,, ,, V 5093.
Catechu Brown.

# Wool Dyeing.

# WOOL DYEING.

## The Direct Cotton Dyestuffs.

Since it has been found that the direct cotton dyestuffs give dyeings on wool, which, contrary to those obtained on cotton, are absolutely fast to washing and in many cases also to milling, these colours have met with considerable application in the dyeing of wool.

In neutral bath these colours also dye any cotton nops which may occur in woollen piece goods, thus rendering the operation of carbonising or burling with pincers unnecessary.

In consequence of the fastness to stoving of the majority of these colours, they are employed in dyeing blankets and flannel goods, for which purpose also their fastness to washing renders them specially suitable; these dyestuffs are often used in the production of colours fast to washing on hosiery and weft yarns, and on shoddy goods.

### Method No. 14.

Dark shades are dyed with 10—20 % Glauber's salt and a small addition of acetic acid (1—5 % according to the exhausting power of the dyestuff.) The goods are entered at 50—60° C., raised to the boil, and dyed for 20 minutes to ½ hour in the boiling bath.

As the acetic acid promotes a rapid exhaustion of the dyebath, and consequently is apt to produce unlevel dyeings, caution is necessary in the use of this addition; it is best to enter the goods into the neutral bath, the acid being afterwards gradually added in small portions from time to time.

Light shades are best dyed with addition of 10 % Glauber's salt, and for dyestuffs which give level shades with difficulty, a further addition of 3—5 % ammonium acetate is recommended. If the bath is not sufficiently exhausted, a little acetic acid may be added towards the end of the dyeing operation.

By after-treating the dyeings so obtained with chromium salts the fastness to milling of certain dyestuffs is considerably increased. An after-treatment with copper salts increases the fastness to light. For these purposes an after-treatment with one of the following salts is employed :—

1—2 % Bichromate of Potash or Soda,
1—3 ,, Chromium Fluoride, or
1—4 ,, Copper Sulphate.

The necessary amount of metallic salt is added to the exhausted dyebath, and the goods are then boiled for ½ hour.

## The Pyrogene Dyestuffs on Wool.

The Pyrogene dyestuffs, up to the present, have been very little used for animal fibres, as these fibres are destroyed by the alkalies used. However, we have succeeded in perfecting a method by which these colouring matters may be applied to animal fibres and mixed fabrics, detailed particulars of which will be found under the heading of "Half-silk," for which textile material it may be advantageously employed.

# The Basic Dyestuffs on Wool.

The basic dyestuffs are seldom employed for wool, as they are not particularly suitable for this fibre. As notable exceptions may be named the various brands of Rhodamine, Victoria Blue, Violet, Crystal Violet and Magenta, which are used in tremendous quantities in wool dyeing.

The usual method of applying the basic dyestuffs to wool is as follows :—

## Method No. 15.

The dyeing is conducted in a bath of condensed water (hard water should be corrected with acetic acid) with addition of 10 % Glauber's salt. The goods are entered at 50° C., the temperature of the dyebath is raised to the boiling point and the dyeing continued for 20 minutes at the boil ; the too rapid absorption of the dyestuff by the wool may be prevented by making a slight addition of acetic acid to the bath.

Auramine O, II, and G should not be heated above 70° C.

Rhodamine G, B, 3 B, and G extra, B extra and 3 B extra, and also Victoria Blue B and 4 R are dyed in a fairly strong acid bath, as follows :—

The Rhodamines with { 15—25 °/o Glauber's Salt.
{ 1— 3 ,, Bisulphate of Soda.

The Victoria Blues B and 4 R with { 10—15 ,, Glauber's Salt.
{ 10—15 ,, Bisulphate of Soda.

or with Glauber's salt and the corresponding quantity of sulphuric acid.

Victoria Blue R is best dyed with—

{ 15—20 °/o Glauber's Salt.
{ 1— 2 ,, Bisulphate of Soda.

## The Dyeing of Pale, Stoved Shades.

Certain of the basic dyestuffs, which are fast to stoving, are used in the production of very pale bright colours on zephyr yarns ; these are dyed in a soap bath, the brilliancy of the dyeings produced being considerably increased by subsequently bleaching the yarn in a sulphur stove.

As suitable for this purpose may be mentioned :

Victoria Blue B, Brilliant Victoria Blue RB, New Victoria Blue GG, Brilliant Glacier Blue, the Violets (Methyl Violet), Rhodamine B and G, Auramine O, II and G.

### Method No. 16.

The yarn is dyed in a lukewarm frothy soap bath until the required shade is obtained, wrung out or hydro-extracted, and hung up in the sulphur stove. After stoving it is well washed.

Hard water should be corrected with soda ; in order to obtain a sufficiency of froth in the dyebath, 3—4 lbs. of soap per 100 gallons is necessary.

The bath may be used for further operations, and is replenished with soap solution and dyestuff.

In a similar manner the above dyestuffs may be dyed in acetic acid bath, and afterwards stoved ; but the shades so obtained are not so brilliant as those produced by dyeing in a soap bath.

For particulars as to the application of Alkali Blue on wool, *see* page 138.

# The Acid Dyestuffs on Wool.

The acid dyestuffs are amongst the most frequently employed colouring matters for wool; the fastness of these colours as a class is sufficient for most purposes, they give level dyeings without difficulty, and dye well through. These properties, combined with the fact that in the acid dyebath wool retains all its natural lustre and feel, render this class of colours particularly suitable for the purpose of dyeing wool.

The method of applying the acid dyestuffs most usually employed is as follows:—

## Method No. 17.

The goods are dyed in 25—50 times their weight of water, with addition of 15—25 % crystallised Glauber's salt (or half this amount of the calcined product) and the necessary amount of acid. After entering at 60° C, the temperature of the bath is gradually raised to the boil.

For pale shades use—
1—2 % Sulphuric Acid, 168° Tw. (D.O.V.)

For darker shades—
3—5 % Sulphuric Acid, 168° Tw. (D.O.V.)

Instead of Glauber's salt and sulphuric acid, bisulphate of soda may be used, in this case

For pale shades use—
3—6 % Sodium Bisulphate.

For darker shades—
6—12 % Sodium Bisulphate.

Dyestuffs which dye level with difficulty are dyed with addition of 2—5 % acetic acid, an addition of sulphuric acid or sodium bisulphate being made towards the end of the dyeing operation. An addition of 2—4 pints ammonium acetate per 100 gallons dye-liquor is also recommended for colours which dye level with difficulty. Boiling in neutral bath is another method of producing level shades.

Hard woven goods and goods difficult to penetrate should be boiled previously in the dyebath before adding the dyestuff.

When using easily level dyeing colouring matters, the goods may be entered into the boiling dyebath, additions of colour may also be made to the boiling bath ; otherwise the bath should always be cooled down before making any after-additions of dyestuff.

The length of the dyeing operation varies from 1—2 hours. After dyeing, the wool is cooled, and afterwards washed well.

The dyebaths may be used for further operations when replenished with ¼ of the original quantities of Glauber's salt or sodium bisulphate.

The Eosines and Phloxines, which, on account of their inferior fastness, might be replaced with advantage by our superior Acid Rhodamines, are dyed with addition of 5 °/o acetic acid.

The various brands of Alkali Blue, which find extensive application in wool dyeing, are dyed according to the following recipe :—

## Method No. 18.

These colours are dyed in weak alkaline bath, generally with addition of

2 —4 °/o Borax, or
½—1 ,, Solvay Soda, or
3 —5 ,, Sodium Silicate
} reckoned on the weight of the goods.

Pales shades are boiled for ½ hour, darker shades for 1 hour.

The goods are then well washed and the blue colour is developed in a fresh warm bath at 50—80° C., containing—

1— 5 °/₀ Sulphuric Acid, 168° Tw., or
3—12 ,, Sodium Bisulphate

for ¼ hour. At the end of this operation the goods are well washed.

The greener brands of Alkali Blue are soured at a fairly low temperature, the redder brands require a somewhat higher temperature, 70—80° C.

The Alkali Blue dyeings may be shaded with other dyestuffs (topped) during the souring process; for this purpose the following are recommended :—Wool Green S, Victoria Blue B, Acid Violet 6 BN, Kiton Red, Rhodamine B, and the various brands of Benzyl Violet and Benzyl Blue.

## Fast Cloth Blue B, BR, R, and G.

Although similar in many respects to the acid colours, these dyestuffs are distinguished by their greatly superior fastness to washing, milling and light, which properties have secured for them an extensive application in the dyeing of woollen yarn and piece goods. In their properties they more nearly approach some of the fastest known mordant dyestuffs, with which they may be dyed in the same bath.

They are applied in a somewhat different manner to the ordinary acid colours according to the following recipe :—

### Method No. 19.

The dyebath is prepared with 3 °/₀ ammonium acetate, or for goods not easily penetrated, with 10 °/₀ salt; the goods are entered at 40—50° C., raised to the boil, and dyed at this temperature ¾—1 hour.

After boiling ½ hour, ½—1 °/₀ acetic acid is added, in order to completely exhaust the dyebath.

If the wool is somewhat alkaline, it is recommended to dye slightly acid with addition of ¼—½ °/₀ bichromate of potash; an after-treatment with bichromate of potash or better still, with

$$\begin{cases} \tfrac{1}{4}\text{—}\tfrac{1}{2}\ ^\circ\!/_\circ \text{ Bichromate of Potash and} \\ \tfrac{1}{4}\text{—}\tfrac{1}{2}\ \ ,, \text{ Copper Sulphate} \end{cases}$$

considerably increases the fastness to light, potting and ironing. This after-treatment is, however, not absolutely necessary.

Copper vessels should be avoided when dyeing with Fast Cloth Blue, or the influence of the copper may be neutralised by hanging strips of zinc in the dyebath.

# Tables showing the Properties of the Acid Dyestuffs.

| NAME OF DYESTUFF. | Method of Application. | Solubility. | FASTNES | |
|---|---|---|---|---|
| | | | Light. ❋ | Was |
| **NAPHTOL YELLOW S** | On wool<br>Method No. 17.<br>On silk<br>Method No. 23. | Very good. | III. | Po |
| **TARTRAZINE** | On wool<br>Method No. 17.<br>On silk<br>Method No. 23.<br>On gloria<br>Method No. 33. | Good. | I—II. | Go |
| **YELLOW W R** | On wool<br>Method No. 17.<br>On silk<br>Method No. 23. | Good. | I—II. | Fairly |
| **ORANGE M N**<br>**,, M N O** | On wool<br>Method No. 17.<br>On silk<br>Method No. 23. | Good. | I—II. | Mode |
| **CHROME FAST YELLOW G**<br>**,, ,, ,, G G** | See under the heading of Mordant Dyestuffs. | | | |
| **AZO YELLOW O**<br>**,, ,, I** | On wool<br>Method No. 17.<br>On silk<br>Method No. 23. | Good. | II. | Fairly |

❋ Dyestuffs possessing the greatest fastness to light are marke

## stuffs.

| WARDS | | | Levelling Properties. | Other Properties. Remarks. |
|---|---|---|---|---|
| ls. | Alkalies. | Stoving. | | |
| r. | Good. | Moderate. | Good. | Used in very large quantities in wool and silk dyeing, also for paper, manufacture of lakes, and wool and silk printing. |
| d. | Good. | Fairly good. | Good. | On account of its pure shade and good fastness to light and washing it is extensively employed in wool dyeing and printing.<br>It is also used for producing shot effects on gloria as it leaves silk white. |
| d. | Good. | Fairly good. | Good. | This colouring matter is principally used for wool dyeing. It is also suitable for colouring food stuffs, being non-poisonous and very soluble. |
| ned by the ıal ur s on ng. | Good. | Not satisfactory. | Good. | A very cheap dyestuff of good covering power. Finds application in the dyeing of wool, silk and jute, also in the manufacture of paper.<br>Used for mode shades on wool. |
| | | | | |
| d; rably than ge O. | Good. | Fairly good. | Good. | Applicable to both wool and silk, very large quantities being used for the latter.<br>Dye wool in neutral bath (useful for union dyeing). Suitable also for wool and silk printing and for dyeing jute and weighted silk. |

se marked IV. are comparatively the poorest in this respect.

| NAME OF DYESTUFF. | Method of Application. | Solubility. | FASTNES | |
|---|---|---|---|---|
| | | | Light. | Wash |
| **CHRYSOIN** | On wool<br>Method No. 17.<br>On silk<br>Method No. 23. | Very good. | II. | Fair<br>goo |
| **CITRONINE 0 0 0**<br>,, **0**<br>,, **I** | On wool<br>Method No. 17.<br>On silk<br>Method No 23. | Fairly good. | II. | Goo<br>On silk<br>to wa |
| **QUINOLINE YELLOW** | On wool<br>Method No. 17.<br>On silk<br>Method No. 23.<br>On cotton<br>Method No. 10 or 11. | Good. | I—II. | Moder |
| **ORANGE II**<br>**N**<br>**R** | On wool<br>Method No. 17.<br>On silk<br>Method No. 23.<br>On cotton<br>Method No. 10 or 11.<br>Weighted silk in bath containing sulphuric acid and "boiled off" liquor. | Very good. | I—II.<br>Orange R is somewhat inferior to the other brands in this respect. | Moder<br>R is fa<br>fast<br>millin |
| **PONCEAU 4161**<br>,, **S**<br>(For Silk) | On wool<br>Method No. 17.<br>On silk<br>Method No. 23.<br>On cotton<br>Method No. 10 or 11. | Very good. | II. | Moder<br>The fast<br>to mill<br>is suffic<br>for lig<br>anne |

## stuffs.

| WARDS | | | Levelling Properties. | Other Properties.<br>Remarks. |
|---|---|---|---|---|
| ds. | Alkalies. | Stoving. | | |
| od. | Good. | Not good. | Good. | For wool and silk dyeing. |
| od. | Good. | Satisfactory | Fairly good. | Suitable, like Azo Yellow, for wool, silk (and weighted silk) and unions, in the last case dyeing the wool in neutral bath. |
| od. | Good. | Satisfactory | Good. | A very pure greenish shade of yellow, fast to light, and of great importance for wool and silk dyeing.<br>Important for discharge printing, as it is not affected by tin crystals and zinc dust. On account of its pure shade it is suitable for shading purposes, and in consequence of its fastness to light for colour lakes and paper dyeing. |
| od. | Good. | Fairly good. | Very good. Frequently employed level dyeing colours. | Important for wool and silk dyeing, especially II., which is cheap and of good colouring power; used either alone, or, on account of their good levelling powers, in mixtures.<br>Applicable for wool and silk printing and jute dyeing. Are also used in some cases for cotton (producing colours of inferior fastness).<br>Orange II and R are suitable for weighted silk. |
| od. | Good. | Good. Becomes a little paler. | Good, but very little used in mixtures. | Extensively employed in the dyeing and printing of wool and silk, also in the manufacture of paper and coloured lakes. In some cases on cotton for bright reds not fast to washing. |

| NAME OF DYESTUFF. | Method of Application. | Solubility. | FASTNES | |
|---|---|---|---|---|
| | | | Light. | Wash |
| **ROCCELINE**<br>**CERASINE** | On wool<br>Method No. 17.<br>On silk<br>Method No. 23. | Fairly soluble. | II—III. | Moder |
| **EOSINE J L I**<br>,, **B**<br>**ERYTHROSINE R**<br>,, **B** | On wool in boiling bath with 5 % acetic acid.<br>On silk in acetic acid bath with "boiled off" liquor.<br>On cotton<br>Method No. 12. | Very good. | III—IV. | Poo |
| **PAPER RED E**<br>,, ,, **P S N R**<br>,, ,, **P S N**<br>,, ,, **P E**<br>,, ,, **V** | On wool<br>Method No. 17.<br>On silk<br>Method No. 23.<br>On cotton<br>Method No. 10 and 11. | Very good. | II. | Moder<br>Rath<br>better t<br>Ponce |
| **BORDEAUX** (for Wool) | On wool<br>Method No. 17.<br>On silk<br>Method No. 23. | Fairly good. | II—III. | Modera |
| **AMARANTH C**<br>,, **B** | On wool<br>Method No. 17.<br>On silk<br>Method No. 23. | Very good. | III. | Modera |

## stuffs.

| WARDS | | | Levelling Properties. | Other Properties.<br>Remarks. |
|---|---|---|---|---|
| ls. | Alkalies. | Stoving. | | |
| d. | Good. | Fairly good. | Not very level dyeing. | For wool and silk dyeing, either alone or in mixtures for Bordeaux, Violet, Grenat, &c. |
| ate. | Good. | Very good. | Good. | Used for wool, silk and cotton, but have been replaced latterly by the faster Rhodamines and Acid Rhodamines.<br>Also in cotton printing (with albumen or chromium acetate). |
| d. | Good. | Good. | Good. | Particularly important for paper and leather dyeing and for the manufacture of lakes; used also in some cases for cotton. Dye wool in neutral bath.<br>P S N R gives a particularly brilliant shade. |
| d. | Good. | Not satisfactory. | Fairly good. | Very similar to Rocceline. |
| r. | Poor. | Not satisfactory. | Very good. | In spite of the inferior fastness of these colours, they are much used as level dyeing colours, on account of the fine full shades they produce. |

| NAME OF DYESTUFF. | Method of Application. | Solubility. | FASTNES | |
|---|---|---|---|---|
| | | | Light. | Wash |
| **COCHINEAL SUBSTITUTE G**<br>„ „ **3 B** | On wool Method No. 17, intended chiefly for printing. For directions see under the heading of "Wool Printing." | Good. | I—II. | Excell |
| **ANTHRACENE RED I** | See under the heading of "Mordant Dyestuffs." | | | |
| **KITON RED S** | On wool Method No. 17. On silk Method No. 23. | Good. | II. | Suffici |
| **ACID RHODAMINE R**<br>„ „ **R R**<br>„ „ **R R R** | On wool Method No. 17. On silk Method No. 23. On weighted silk, in "boiled off" liquor bath with addition of sulphuric acid. | Good. | II—III. The brand R R is particularly good. | Gooc Stai neither ' nor cot during millin proce |
| **BENZYL BORDEAUX B** | On wool Method No. 17. | Good. | II. | Gooc |

## estuffs.

| OWARDS. | | | Levelling Properties. | Other Properties.<br>Remarks. |
|---|---|---|---|---|
| ids. | Alkalies. | Stoving. | | |
| od. | Good. | Good. | Give very even prints. | Very little used for dyeing, chiefly for wool and silk printing, in which industries they are largely employed. |
| | | | | |
| cient. | Good. | Very good, | Excellent. | An excellent level dyeing colour employed for the production of the most delicate pale shades.<br>Also of interest for silk. |
| od. | Good. | Very good. | Good. | In consequence of their fastness to light, they may be used as substitutes for the Eosines. They dye easily level, and penetrate the hardest goods perfectly, and when shaded with Orange or Yellow dyestuffs, give beautiful scarlet shades.<br>Important for weighted silk and wool and silk printing. They retain their shades in artificial light. |
| od. | Very good. | Very good. | Good. | On account of its excellent fastness to alkali, its low cost and its beauty of shade, this colour is especially suitable for the dyeing of dress goods and knitting yarn. |

| NAME OF DYESTUFF. | Method of Application. | Solubility. | FASTNES | |
|---|---|---|---|---|
| | | | Light. | Wash |
| **ACID VIOLET 7 B**<br>,, ,, 6 B N<br>,, ,, 4 B N<br>,, ,, 3 B N<br>,, ,, 4 R<br>,, ,, 4 R N | On wool Method No. 17. On silk Method No. 23. Acid Violet 4 R on weighted silk in "boiled off" liquor bath, with addition of sulphuric acid. | Good. Should be dissolved in *soft* water *without acid.* Hard water should be corrected with a trace of soda. | III. | Mode Sufficie withst a slig milli |
| **ALKALI VIOLET** | On wool in neutral bath, a slight addition of acetic acid being made towards the end of the operation. Also Method No. 18. On silk Method No. 24 or No. 23. When applied to wool in combination with acid dyestuffs, the goods are dyed ½ hour neutral, and the acid is then added. | Good. Should be dissolved without acid. | III. | Goo Of gre importa for woo accoun its fastn to milli |

## estuffs.

| OWARDS | | | Levelling Properties. | Other Properties. Remarks. |
|---|---|---|---|---|
| ids. | Alkalies. | Stoving. | | |
| od. | Sufficient. | Poor. | Good, with the exception of 7 B. | These products find considerable application in wool and silk dyeing and printing; 7 B exhausts more rapidly than 6 B N, and on this account does not dye so level.<br>The principal brands are 6 B N and 3 B N. 4 B N dyes wool equally well in neutral, alkaline, or acid bath, and consequently is useful in union dyeing (half-wool).<br>They are also applied in the dyeing of hat bodies and feathers.<br>4 R S N is chiefly used for silk.<br>They withstand tin crystals discharge. |
| od. | Fairly good. | Not good. | Dyes very level in neutral bath. | On account of its good level dyeing properties, of considerable interest for wool, silk and unions (dyes wool in neutral bath). May be used in combination with the dyewoods, and after-treated with copper and iron sulphate in the same bath.<br>Suitable for weighted silk, to which it is applied in neutral "boiled off" liquor bath at 50° C., being afterwards developed with sulphuric acid. |

| NAME OF DYESTUFF. | Method of Application. | Solubility. | FASTNES | |
|---|---|---|---|---|
| | | | Light. | Wash |
| **BENZYL VIOLET 4 B**<br>**6 B**<br>**10 B**<br>**BENZYL BLUE B**<br>**S** | On wool<br>Method No. 17.<br>On silk<br>Method No. 23.<br>On unions<br>Methods No. 26 and 27. | Good. | III. | Goo<br>Better<br>the va<br>Aci<br>Viol<br>Withs<br>eve<br>stro<br>alkal<br>milli |
| **PURE BLUE A A I**<br>„ „ **A I**<br>„ „ **A R I**<br>„ „ **B S I**<br>„ „ **B for Silk**<br>**WATER BLUE C III**<br>**NAVY BLUE 5 R**<br>**R III**<br>**R S P** | On wool<br>Method No. 17.<br>On silk<br>Method No. 23.<br>On cotton<br>Methods No. 7 and 9. | Very good. | II—III. | Poo |
| **NAVY BLUE B W**<br>**H H** | On wool<br>Method No. 17. | Very good. | II—III. | Goo |

## stuffs.

| WARDS | | | Levelling Properties. | Other Properties. Remarks. |
|---|---|---|---|---|
| s. | Alkalies. | Stoving. | | |
| d. | Good. | Good. The shades are very little altered. | Fair. In neutral bath very good. | These colours dye wool in neutral bath; this property renders them useful for union dyeing. The cotton remains quite white in neutral bath. (Important for shot effects.)<br>Also useful for woollen piece goods and yarn and for silk. Their neutral dyeing property renders them of use in shoddy dyeing.<br>Applicable for wool and silk printing.<br>After-treatment with chrome darkens the shade (particularly Benzyl Violet 4 B) without increasing the fastness. They may therefore be used for shading mordant dyestuffs. |
| ood. | Poor. | Fairly good. | Not so good. Only applicable for blue, not suitable for mixtures. In the darker shades the fastness to rubbing is not perfect, especially if the acid is added too quickly. | Pure Blue A A I, A I and A R I are intended for cotton, although they are also used in large quantities for wool and silk; the first is especially useful for blue and navy shades and for topping logwood.<br>On account of their fastness to light the Pure Blues are very suitable for paper (tinting for white), for jute, cocoanut fibre, the manufacture of lakes and washing blue, also for cotton and silk printing in cases where fastness to light is the chief consideration and fastness to washing is of minor importance.<br>The Navy Blues and Pure Blue B for silk are mostly used for silk dyeing. |
| d. | Good. | Good. | Very good. | Give very fine Navy shades on wool, and are distinguished for their great covering power and low cost, and their excellent fastness towards washing, light and stoving, as well as their level dyeing properties.<br>They are suitable for dyeing dress goods and gentlemen's suitings, also for knitting yarns.<br>White cotton checking threads are not stained. |

| NAME OF DYESTUFF. | Method of Application. | Solubility. | FASTNE | |
|---|---|---|---|---|
| | | | Light. | Wa |
| **Bleu Fluorescent** (Fluorescent Blue) | On wool<br>Method No. 17.<br>On silk<br>Method No. 23,<br>in "boiled off" liquor bath with sulphuric acid. | Fairly good. | III—IV. | P |
| **Alkali Blue 3 R**<br>**2 R**<br>**R**<br>**B**<br>**2 B**<br>**3 B**<br>**4 B**<br>**5 B**<br>**6 B** | On wool<br>Method No. 18.<br>On silk<br>Method No. 24.<br>On cotton<br>Method No. 26. | Fairly good. | II.<br>The redder marks rather better. | G<br>Fair<br>to<br>It b<br>p<br>bu<br>sh<br>re-de<br>so |
| **Gallocyanine D H**<br>**B S**<br>**S R** | See under the heading of "Mordant Dyestuffs." | | | |
| **Induline** | On wool<br>Method No. 17.<br>On silk<br>Method No. 23. | Good. | II—III. | Mo |
| **Kiton Blue B** | On wool<br>Method No. 17.<br>On silk<br>Method No. 23. | Good. | II. | G |

## estuffs.

| OWARDS | | | Levelling Properties. | Other Properties. Remarks. |
|---|---|---|---|---|
| ds. | Alkalies. | Stoving. | | |
| od. | Moderate. | Poor. | Good. | Used principally for the production of fluorescent blues, greens, violets, &c. (with Quinoline Yellow and Rhodamine) on silk. |
| good. | Becomes paler, acids produce the blue again. | Good. | Very good in alkaline bath. | Important for wool, silk (for shading logwood black), unions (one bath method), and the manufacture of lakes. |
| | | | | |
| d. | Becomes redder. | Good. | Not very level dyeing. Sufficient for blue and navy on wool.<br>On silk good | Used in wool and silk dyeing, particularly the latter, also for unions (shoddy). Suitable for wool and silk printing.<br>Employed with Acid Black for cheap navies, also with logwood. |
| d. | Good. | Excellent. | Very good. | An excellent level dyeing colour giving very fine greenish blue shades; suitable for use either alone or in mixtures for the production of mode shades. |

| NAME OF DYESTUFF. | Method of Application. | Solubility. | FASTNE | |
|---|---|---|---|---|
| | | | Light. | Was |
| **Fast Cloth Blue G**<br>,, ,, **R**<br>,, ,, **B**<br>,, ,, **R B** | On wool<br>Method No. 19. | Good. | I. | Very<br>Wit<br>ev<br>st<br>mil |
| **Acid Green O Yellow Shade**<br>,, **O Blue Shade** | On wool<br>Method No. 17.<br>On silk<br>Method No. 23. | Very good. | III. | P |
| **Wool Green S** | On wool<br>Method No. 17.<br>On silk<br>Method No. 23.<br>If excess of acid be used when dyeing wool, a large amount of colouring matter remains in the dyebath. | Good. | II. | Very<br>Con<br>ably<br>t<br>Acid |

## stuffs.

| WARDS. | | | Levelling Properties. | Other Properties.<br>Remarks. |
|---|---|---|---|---|
| ls. | Alkalies. | Stoving. | | |
| ood. rned by ral s. | Good. | Not good. | Good. | On account of their fastness to milling and light of great importance in the dyeing of woollen yarn and piece goods. As they dye wool in neutral bath they are useful for union dyeing. They may be dyed in combination with direct dyestuffs suitable for wool (Cotton Yellow C H, Direct Pink, Direct Safranine, &c ), also with mordant colours, as the after-chroming process does not affect them. The Fast Cloth Blues are best dyed in wooden vessels.<br>Of interest for slubbing printing. |
| d. | Poor. | Fairly good. | Good. | Commonly employed dyestuffs for wool and silk in cases where fastness is of minor importance.<br>Applicable for wool and silk printing. |
| d. | Good. Also better than Acid Green. | Fairly good. | Very good. One of the best level dyeing colours. | In consequence of its excellent level dyeing properties, much appreciated for dyeing all kinds of wool. It is suitable also for silk, unions, feathers, straw plait, &c.<br>The cotton is not stained in acid bath, white cotton lists remain perfectly white |

| NAME OF DYESTUFF. | Method of Application. | Solubility. | FASTNES | |
|---|---|---|---|---|
| | | | Light. | Wash |
| **ANTHRACENE ACID GREEN** | On wool<br>Methods<br>No. 17 and No. 21,<br>may also be dyed neutral.<br>On silk<br>Method No. 23. | Very good. | II. | Very g<br>Withs<br>a sev<br>alkal<br>milli |
| **KITON GREEN** | On wool<br>Method No. 17.<br>On silk<br>Method No. 23.<br>On weighted silk in acid bath containing "boiled off" liquor. | Very good. | III. | Goo<br>Much l<br>tha<br>Acid G<br>Cotto<br>sligh<br>staine<br>stro<br>millir |
| **BENZYL GREEN B** | On wool<br>Methods<br>No. 17 and No. 21.<br>On silk<br>Method No. 23.<br>On weighted silk in acid bath containing "boiled off" liquor. | Very good. | III. | Very g<br>Very fa<br>millir<br>suitabl<br>wool<br>gooc<br>Increas<br>afte<br>chrom |
| **GREY R**<br>,, **B**<br>,, **B B** | On wool<br>Method No. 17.<br>On silk<br>Method No. 23. | Very good. | II—III. | Fairly g |

# tuffs.

| VARDS. | | | Levelling Properties. | Other Properties.<br>Remarks. |
|---|---|---|---|---|
| . | Alkalies. | Stoving. | | |
| . | Good. Much better than Acid Green. | Good. | Very good. Additions of colour may be made at the boil. | A very useful level dyeing colour for wool, superior in every respect to Acid Green.<br>In wool and silk unions the silk is dyed paler but the same tone.<br>In wool and cotton unions the cotton remains white.<br>The colour is fast to steaming and carbonising and retains its shade in artificial light.<br>Withstands chroming and is therefore often used with mordant dyestuffs.<br>Suitable for silk dyeing. |
| .. | Good. Better than Acid Green. | Good. | Good. | Used for wool and silk dyeing and printing.<br>Particularly important for weighted silk. |
| . | Sufficient. | Very good. | Very good. | A level dyeing colour for use alone or in mixtures with mordant dyestuffs. Fast to milling and stoving (for flannels). Dyes wool in neutral bath (important for unions). Applicable in dyeing and printing of slubbing.<br>Fast to water, hence suitable for silk. Used also in wool and silk printing. |
| . | Moderate. Are turned redder. | Fairly good | Moderate. | Used in wool and silk dyeing, also for jute; further for paper, lakes, inks, and similar purposes. Also for pale greys on cotton (with alum or in the size). |

| NAME OF DYESTUFF | Method of Application. | Solubility. | FASTNE | |
|---|---|---|---|---|
| | | | Light. | Wa |
| **Acid Brown B**<br>**G**<br>**V** | On wool Method No. 17. On silk Method No. 23. G on weighted silk in acid "boiled off" liquor bath. | Very good. | II—III. | Fairl |
| **Resorcine Brown** | On wool Method No. 17. On silk Method No. 23. | Fairly good. | II—III. | P |
| **Chrome Fast Brown G**<br>**R**<br>**B** | See under the heading of "Mordant Dyestuffs." | | | |
| **Acid Black N N**<br>**H A**<br>**D**<br>**S**<br>**3 X**<br>**D K** | On wool Method No. 17. On silk Method No. 23. | Good. | II. | G<br>W<br>cot<br>slig<br>sta<br>du<br>millir<br>not |
| **Benzyl Black B**<br>**4 B** | On wool Method No. 17, but still better with 10 % Glauber's Salt 3—5 % Acetic Acid, and an addition of ½—2 % Sulphuric Acid towards the end of the operation. | Good. | II. | G |

# estuffs.

| OWARDS | | | Levelling Properties. | Other Properties. Remarks. |
|---|---|---|---|---|
| ds. | Alkalies. | Stoving. | | |
| od. | Good. | Poor. | Moderate. | Applied to wool and silk, sometimes also to jute, either alone or in mixtures, for the production of brown shades. |
| od | Good. | Poor. | Moderate | Used for the same purposes as Acid Brown, also for leather dyeing. |
| | | | | |
| od. | Good. | Poor | Good. | Used in large quantities, alone and in mixtures, for black and navy. Fast to water on wool and silk.<br>Cotton threads are not stained, hence these colours may be used for dyeing piece goods with white cotton lists. Wool is dyed equally well with either acetic or sulphuric acid.<br>D and D K are the most important brands for wool printing.<br>The fastness to carbonising is good. |
| d. | Good. | Poor. | Very good. | Benzyl Black B and 4 B are two dyestuffs which give very fine bloomy shades similar to logwood black, and possessing also the same overhand appearance. They are remarkable for their splendid covering power and low cost.<br>The fastness to washing, finishing, light, rubbing off, alkali and perspiration is excellent.<br>Applicable also for wool printing. |

# The Mordant Dyestuffs on Wool.

The mordant dyestuffs, which, on account of their excellent fastness, find extensive application in wool dyeing, may be applied in two different ways :—

1. By mordanting first and dyeing afterwards.
2. By dyeing first and after-chroming.

Although the first method is still often used, for example, with alizarin colours and our Gallocyanines, it has been replaced, in the majority of cases, by the after-chroming process, by which simple method of application equally fine and fast colours are obtained ; in some cases the dyeings so produced are even faster and more brilliant.

For the sake of completeness, both methods are here described :—

## Dyeing on Chromium Mordant.

### Method No. 20.

The goods are mordanted before dyeing with

$\left\{\begin{array}{l}\text{3\% Bichromate of Potash or Soda}\\ \text{2}\tfrac{1}{2}\text{\% Tartar.}\end{array}\right.$

Instead of the latter,

2½% Lactic Acid (50%) or
1—2% Oxalic Acid

may be used.

The goods are entered at 50—60° C., raised to boil, and boiled 1—1½ hours, until the mordanting bath is sufficiently exhausted, and washed well.

The mordanted goods are then entered cold into the dyebath, which is acidulated with acetic acid, raised to boil, and boiled for some time. The duration of the dyeing operation being 1—2 hours.

The following colouring matters may be applied in this way :—

Gallocyanine,
Chrome Fast Yellow G and GG,
Chrome Fast Brown G, R, B, and
Anthracene Red.

## Dyeing and After-Chroming.

### Method No. 21.

The goods are dyed with addition of

$\left\{ \begin{array}{l} 10\% \text{ Glauber's Salt} \\ 5\text{—}10\% \text{ Acetic Acid} \end{array} \right.$

entered at 60° C., raised to boil, and, after boiling ½ hour, 1—2% sulphuric acid is added to the bath, and the boiling continued for ½ hour longer. The dyebath should then be exhausted ; an addition of

1—1½% Bichromate of Potash

is then made to the exhausted bath, and the boiling continued for a further period of ½ hour, after which the goods are well washed.

This method is suitable for the dyestuffs named above, and to this list may be added Chrome Fast Black F, R, BB, FR and FW. In mixtures Fast Cloth Blue may also be applied according to the above directions.

The bichromate of potash may be replaced by the corresponding amount of chromium fluoride ; dyeings obtained with the latter are brighter and bluer.

Certain dyestuffs are not affected by this after-chroming process, and these may serve as shading dyestuffs.

Such are :—Azo Yellow O, I, Naphthol Yellow S, Tartrazine, Orange MNO and N, Amaranth G and B, Acid Violet 4 R and 6 BN, Benzyl Violet, Kiton Red, Wool Green S, and Kiton Green.

# Mordant (Chr

| NAME OF DYESTUFF. | Method of Application. | Solubility. | FASTN | | |
|---|---|---|---|---|---|
| | | | Light. ⁂ | Washing. | M |
| **Chrome Fast Yellow G**<br>**GG** | On wool Method No. 21, and sometimes Method No. 20. | Very good. | I—II. G rather better than GG. | Very good. | C<br>V<br>mil<br>½ h<br>50°<br>2½ lb<br>2½ lb<br>pe<br>ga<br>whi<br>and<br>ar<br>st |
| **Anthracene Red I** | On wool with Glauber's salt and acetic acid, or Methods No. 20 and No. 21. | Good. | I—II. | Very good. | Ver<br>Dir<br>or<br>ch<br>the<br>with<br>se<br>m<br>wi<br>ble<br>int<br>w<br>whit<br>is s |
| **Gallocyanine DH**<br>,, **BS**<br>,, **SR**<br>All in the form of a 10 % paste. May also be obtained in powder. | On wool Method No. 20. On cotton Method No. 13. | Is not soluble in water, but is perfectly miscible. | II. | Very good. | Ver<br>bc<br>cott<br>v |

⁂ Dyestuffs possessing the greatest fastness to light are mar

# stuffs.

| WARDS | | | Levelling Properties. | Other Properties.<br>Remarks. |
|---|---|---|---|---|
| ls. | Alkalies. | Finishing. | | |
| d. | Very good. | Very good. Neither wet finishing nor dry finishing alters the shades. | Very good. | On account of their fastness to washing, milling, light, acids and stoving equally useful for the dyeing of hosiery and weft yarns as of piece goods.<br>Applicable for calico and slubbing printing.<br>Very fast to stoving. |
| d. | Very good. | Very good. Withstands both wet and dry finishing. | Very good. | In consequence of its fastness to light and milling, of considerable importance in wool dyeing. Forms a suitable substitute for Alizarin Red.<br>Fast to stoving (important for flannels). Gives a fine red on unprepared yarn, which is useful for carpet printing. |
| d. | Very good. | Very good. | Very good. | Give very fast shades on wool and cotton, and may be used in combination with Alizarin dyestuffs. Their principal use is in the production of discharge effects in calico printing and wool printing. They withstand tin crystals discharge, but may be discharged by oxidising agents. |

se marked IV are comparatively the poorest in this respect.

## Mordant (Chr

| NAME OF DYESTUFF. | Method of Application. | Solubility. | FASTNE | | |
|---|---|---|---|---|---|
| | | | Light. | Washing. | M |
| **ANTHRACENE ACID GREEN** | See under the heading of "Acid Dyestuffs." | | | | |
| **FAST CLOTH BLUE G**<br>,, R<br>,, B<br>,, R B | See under the heading of "Acid Dyestuffs." | | | | |
| **CHROME FAST BROWN G**<br>,, R<br>,, B | On wool Method No. 20 or Method No. 21. | Very good. | G I—II.<br>R and B I. | Very good. | Very I ren ra ligh very mi |
| **CHROME FAST BLACK F**<br>R<br>B B<br>F R<br>F W | On wool Method No. 21 also Method No. 20. | Very good, especially F, which is particularly suitable for apparatus dyeing. | I. | Very good. Absolutely fast to water. | G Wit per a m with F parti fast res |

# stuffs.

| OWARDS | | | Levelling Properties. | Other Properties. Remarks. |
|---|---|---|---|---|
| ds. | Alkalies. | Finishing. | | |
| | | | | |
| | | | | |
| od. | Good. | Good. Withstands both wet and dry finishing. | Very good. Penetrate hard goods perfectly. | On account of their fastness of great value in dyeing loose wool, yarn and piece goods. May be used in combination with Alizarin dyestuffs on chrome mordanted goods. Useful for slubbing printing. |
| od.<br>ffected the nising ess.<br>t to ration | Good. | Good. Chrome Fast Black BB becomes browner on long steaming in damp state, the others are less affected. | Very good. Penetrate heavy piece goods thoroughly. | These colouring matters are excellently adapted for the dyeing of piece goods, woollen and worsted yarn, slubbing (especially F), loose wool, wool and hair felt, &c.<br>May be applied in combination with easy levelling colours Alizarin dyestuffs and dyewoods, also with Fast Cloth Blue. The fastness to stoving is good. |

# WOOL DYESTUFFS,

## ARRANGED ACCORDING TO THEIR FASTNESS AND APPLICATION.

### Dyestuffs which may be Dissolved in the Hot Acid Dyebath.

Naphtol Yellow S
Quinoline Yellow
Tartrazine
Orange II, R
Paper Red PSN, PE
Ponceau S for silk
,, 4161
Kiton Red S
Amaranth G and B
Acid Violet 4 R, 3 BN, 6 BN, 7 B
Kiton Blue
Kiton Green B
Benzyl Green B
Anthracene Acid Green
Navy Blue BW and HH

### Easy Levelling Dyestuffs for Wool.

Excellent level dyeing colours are—

Naphtol Yellow S
Azo Yellow O, I
Orange II
Rhodamine G, B
Diamond Magenta
Kiton Red S
Violet 3 R—4 B
Crystal Violet 5 BO
Kiton Blue B
Wool Green S
Alkali Blue 3 R—6 B

As sufficiently level dyeing for ordinary requirements the following may also be mentioned :—

Quinoline Yellow
Tartrazine
Orange MNO, N, R
Ponceau S for silk 4161
Benzyl Bordeaux B
Acid Violet 7 B—4 R
Benzyl Violet 10 B, 6 B, 4 B (neutral, very good)
Alkali Violet O
Victoria Blue B (not in mixtures)
Navy Blue BW and HH
Acid Green O yellow shade
,, ,, O blue shade
Benzyl Green B (neutral, very good)
Acid Black NN, 3 X, D
Chrome Fast Yellow G, GG
Chrome Fast Brown G, R, B
Chrome Fast Black F, BB
,, ,, ,, FW, R

# Wool Dyestuffs Fast to Milling.

The following dyestuffs withstand a moderate milling with soap, and do not usually stain white wool during the process. Those marked with an asterisk * stain white wool slightly :—

## Acid and Mordant (Chrome) Dyestuffs.

*Quinoline Yellow
Tartrazine
*Orange N
,, R
Ponceau S for silk, 4161
Paper Red PSN, E
Rocceline
Benzyl Bordeaux B
Acid Rhodamine R, RR
,, ,, RRR
Anthracene Red I
Benzyl Violet 6 B, 10 B
,, ,, 4 B, 5 B
Induline
Acid Violet 3 BN, 4 BN
Acid Violet 6 BN, 7 B
Alkali Violet
Fast Cloth Blue G, R
,, ,, ,, R RB
Grey R, B, BB
*Wool Green S
Anthracene Acid Green
Benzyl Green B
Benzyl Blue B, S
Chrome Fast Yellow GG, G
Chrome Fast Brown R, G, B
Chrome Fast Black F, BB
,, ,, ,, FW, R
Acid Black NN, 3 X
,, ,, D

## Basic Dyestuffs.

Rhodamine G, B
Diamond Magenta
Violet 3 R—4 B
Ethyl Violet
Crystal Violet 5 BO
Victoria Blue B

## Direct Dyestuffs.

Cotton Yellow CH
Direct Yellow CR
Direct Orange G
,, ,, R
Acid Congo R
Cotton Red 4 B
Direct Pink BN
,, ,, GN
Direct Safranine G
,, ,, B
Chlorantine Red 4 B
,, ,, 8 B
Acetylene Blue 3 R (stands a light milling)
Direct Blue BX
Acetylene Blue BX
Direct Blue W 104

Direct Blue 3 B
,, ,, 2 B
Acetylene Blue 3 B
As Acetylene Blue 3 R.

Acetylene Blue 6 B
Acetylene Pure Blue
Direct Light Blue 550
Direct Sky Blue, green shade
Acetylene Sky Blue
Direct Green B 695
Melantherine BH
,, HW
Indigene Black 2980
Direct Brown M
Direct Brown R
Cupranil Brown B
,, ,, G
,, ,, R

The direct dyestuffs do not bleed into white wool during milling, but white cotton becomes more or less stained.

# Wool Dyestuffs Fast to Finishing

## (Steaming.)

### Acid Dyestuffs.

Quinoline Yellow
Naphtol Yellow S
Tartrazine
Orange II, R
Eosine
Erythrosine
Ponceau S for silk
,, 4161

### Basic Dyestuffs.

Rhodamine B, G
Diamond Magenta
Violet 4 R—3 B
Crystal Violet 5 BO

In addition, those direct dyestuffs which are applicable to wool.

### Mordant Dyestuffs.

Chrome Fast Yellow G, GG
Chrome Fast Brown G, B, R

The above dyestuffs withstand the severest finishing process ; the requirements for piece goods are not quite so exacting, and are met by the following :—

Azo Yellow O, I
Orange M N O
Kiton Red S
Rocceline
Benzyl Bordeaux B
Acid Violet 7 B—4 R
Pure Blue ARI—BSI
Alkali Blue 6 B—3 R
Kiton Blue
Alkali Violet O
Benzyl Violet 10 B—4 B
Navy Blue BW, HH
Acid Green O yellow shade
,, ,, O blue shade
Wool Green S
Anthracene Acid Green
Kiton Green B
Benzyl Green B
Acid Black NN, 3 X, D
Chrome Fast Black BB, F
,, ,, ,, FW
Grey B, BB, R
Victoria Blue 4 R, B
Benzyl Black B, 4 B

# Wool Dyestuffs Fast to Stoving.

Those colours marked with an asterisk * answer the highest requirements in this respect.

## Basic Dyestuffs.

*Auramine G, O, II
*Rhodamine B, G
Diamond Magenta
Violet 3 R—3 B
Crystal Violet 5 B O
*Victoria Blue 4 R, B
,, ,, R
*Night Blue

## Acid Dyestuffs.

*Quinoline Yellow
*Naphtol Yellow S
Azo Yellow O, I
Orange M N O, II
,, R, N
*Tartrazine
*Ponceau S for silk, 4161
*Kiton Red S
Rocceline
Benzyl Bordeaux B
Benzyl Violet 4 B—10 B
Amaranth G and B
Anthracene Red
Anthracene Acid Green
*Wool Green S
Benzyl Green S
Acid Violet 4 R—7 B
Benzyl Blue B, S
Navy Blue BW, HH
*Grey R, B, BB
*Chrome Fast Yellow G, GG
*Chrome Fast Brown B, R, G
*Chrome Fast Black BB, R
* ,, ,, FR, F, FW
Benzyl Black B and 4 B

## Direct Dyestuffs.

*Cotton Yellow CH
*Direct Yellow CR
Direct Orange G, R
Direct Violet C, CB, N
Acid Congo R
Chlorantine Red 4 B, 8 B
Direct Safranine G, B
*Direct Blue 2 B, 3 B
Direct Blue BX, 3 R, W 104
*Direct Sky Blue green shade
Acetylene Pure Blue
Acetylene Sky Blue
* Direct Light Blue 550
*Acetylene Blue 3 B
,, ,, 6B, BX, 3R
Direct Green J, B 695
Direct Brown R, M
Melantherine BH, HW, JH

## Wool Dyestuffs Fast to Acids.

Those marked with an asterisk * are fast to carbonising, the rest are simply fast to perspiration. 1 represents "very good," 2 represents "sufficient."

### Acid Dyestuffs.

| | |
|---|---|
| 1 | *Quinoline Yellow |
| 1 | *Naphtol Yellow S |
| 2 | *Azo Yellow O, I |
| 1 | *Orange II, R |
| 1 | *Tartrazine |
| 2 | *Orange MNO, N |
| 1 | *Acid Rhodamine R, RR |
| 1 | * ,, ,, RRR |
| 1 | *Amaranth G, B |
| | Benzyl Bordeaux B |
| 1 | *Ponceau |
| | Paper Red PSN, PE, E |
| 2 | *Rocceline |
| 1 | *Eosine |
| 1 | *Erythrosine |
| 1 | *Anthracene Red |
| 2 | *Alkali Blue 6 B—3 R |
| 2 | *Alkali Violet |
| 2 | *Acid Violet 4 R |
| 1 | *Acid Violet 3 BN, 4 B N |
| 1 | * ,, ,, 6 BN, 7 B |
| 1 | *Benzyl Violet 4 B—10 B |
| 1 | *Acid Green O yellow shade |
| 1 | * ,, ,, O blue shade |
| | Kiton Blue |
| | Navy Blue BW, HH |
| 1 | *Benzyl Blue B, S |
| 1 | *Induline |
| 1 | *Wool Green S |
| | Benzyl Green B |
| | Anthracene Acid Green |
| | Kiton Green B |
| 1 | *Acid Black 3 X |
| 1 | * ,, ,, NN, HA |
| | Benzyl Black B, 4 B |

---

### Mordant Dyestuffs.

| | |
|---|---|
| 1 | *Chrome Fast Yellow GG |
| 1 | * ,, ,, ,, G |
| 1 | *Chrome Fast Brown R |
| 1 | *Chrome Fast Brown G, B |
| 1 | *Chrome Fast Black R |
| | Chrome Fast Black FW, BB, F |

## Basic Dyestuffs.

Auramine II, O
Patent Phosphine G, GG
1 *Rhodamine G, B
,, 3 B
Diamond Magenta
2 *Violet 2 B, 3 B
2 *Crystal Violet 5 BO
Brilliant Violet 6 B, 8 B
Victoria Blue 4 R
,, ,, B
Brilliant Victoria Blue RB

## Direct Dyestuffs.

All direct dyestuffs applicable to wool are sufficiently fast to perspiration. The fastness to carbonising does not come into consideration, as the burls are dyed by these colours, thus rendering the process of carbonising unnecessary.

# Dyestuffs suitable for the Dyeing of Carpet Yarn.

Chrome Fast Yellow GG
,, ,, ,, G
Chrome Fast Brown G
,, ,, ,, R
,, ,, ,, B
Chrome Fast Black F
,, ,, ,, R
,, ,, ,, BB
Anthracene Red I

After-treated with 1·5 % Bichrome.

Quinoline Yellow
Tartrazine
Kiton Red
Benzyl Bordeaux B
Rocceline
Paper Red PSN
,, ,, PE
Acid Violet 4 R
Induline
Wool Green S
Benzyl Green B
Kiton Green
Grey BB
,, R, B
Benzyl Black B, 4 B

## Dyestuffs particularly suitable for Shoddy and Mungo.

Naphtol Yellow S.
Tartrazine.
Direct Yellow T.
Fast Yellow R1209.
Orange MNO, II.
Rhodamine B.
Direct Safranine G, B.
Anthracene Red
Cotton Red 12 B.
Diamond Magenta.
Benzyl Bordeaux B.
Cotton Red 11 B 1436.
Tolamine Violet N.
Direct Blue W 104.
Benzyl Violet 4 B, 6 B, 10 B.
Acid Violet 3 BN, 4 BN.
,, ,, 6 BN, 7 B.
Opaline 2 G.
Alkali Violet O, I.
Violet 3 R—4 B.
Crystal Violet 5 BO.
Pure Blue (all brands).
Brilliant Violet 6 B & 8 B.
Victoria Blue B, R, 4 R.
Benzyl Blue B and S.
Brilliant Victoria Blue RB.
Alkali Blue 3 R—6 B.
Direct Indigo Blue BN.
,, ,, ,, BNK, A, BK.
Kiton Green B.
Tolamine Green B.
Wool Green S.
Benzyl Green B.
Fast Green O and JJO.
Cupranil Brown B.
,, ,, G, R.
Acid Black (all brands).
Carbide Black R I.
Direct Deep Black 1718.

Shoddy is dyed with direct dyestuffs in 10—15 times its weight of water, with addition of 40 lbs. Glauber's Salt per 100 gallons, for ½ hour boiling.

Direct dyestuffs are especially suitable for the dyeing of mungo or shoddy containing cotton, or such as is required fast to washing.

Basic dyestuffs are applied in neutral bath.

Acid dyestuffs and Victoria Blue R and 4 R are dyed for 1 hour at the boil, with an addition 8 % sulphuric acid.

## Wool Dyestuffs fast to water.

The dyestuffs in the following list do not bleed into either white wool or white cotton on steeping 3 days in cold water.

Chrome Fast Yellow G, GG.
Tartrazine.
Cotton Red D.
Acid Congo R 1573.
Acid Rhodamine R, RR.
,, RRR.
Anthracene Red.
Amaranth G, B.
Acid Violet 3 BN, 6 BN.
,, 7 B, 4 BN.
Benzyl Violet 4 B, 6 B, 10 B.
Alkali Violet.
Pure Blue B.
Water Blue C III.
Victoria Blue 4 R, R.
Alkali Blue 6 B, BB, R, 3 R.
Benzyl Blue S, B.
Navy Blue RIII.
Induline.
Benzyl Green B.
Kiton Green.
Chrome Fast Black F, R.
,, ,, ,, B, FR, FW.
Grey R, B, BB.

# Silk Dyeing.

# SILK DYEING.

## The Direct Cotton Dyestuffs.

Many direct cotton (substantive) dyestuffs give dyeings on silk which, like those obtained on wool, are remarkable for their excellent fastness to water and washing; they have, on this account, met with considerable application in the dyeing of silk.

They are particularly useful for the manufacture of embroidery silks fast to washing, and are also used in the dyeing of silk thread effects fast to milling, and in the dyeing of waste silk (Bourette).

By diazotising and developing, or by after-treatment with metallic salts, shades are produced which answer the highest requirements as regards fastness to washing, and which withstand the severest possible treatment with alkalies to which they may be subsequently subjected.

### Method No. 22.

The direct cotton colours are applied to silk either in weakly acid bath containing Glauber's salt, or in a "boiled off" liquor bath acidified with acetic acid.

The method of working is as follows :—

### (a) Dyeing in Glauber's Salt Bath.

The dyebath is prepared, according to the depth of the shade required, with 5—10 % Glauber's salt, the goods are entered at 40—50 C., raised gradually to the boil, the acetic acid being added in small quantities from time to time. 1—10 % acetic acid is required, according to the exhausting power of the dyestuff ; for pale shades the acetic acid may be omitted, or the minimum quantity will be found to be quite sufficient.

If a further addition of dyestuff is required for shading purposes, the bath should be cooled down somewhat.

### (b) Dyeing with Direct Dyestuffs in a Bath containing "boiled off" liquor and acetic acid.

The silk is dyed in a bath containing 15 °/₀ (on the volume of the dyebath) "boiled off" liquor, with addition of just sufficient acetic acid to render the bath neutral or slightly acid.

The addition of acetic acid varies according to the depth of shade required, and to the exhausting power, *i.e.*, the levelling properties of the dyestuff ; rapidly exhausting colouring matters require less, dyestuffs which exhaust more slowly require more acetic acid ; as much as 10 per cent. may be required.

After dyeing, the silk is brightened with sulphuric or acetic acid, in the usual manner.

### Diazotising and Developing.

This process may be applied to silk by dyeing with suitable direct cotton colours, and afterwards diazotising and developing according to the directions given for cotton. The fastness of the developed colours so obtained is about the same as those of the developed dyeings on cotton. Silk yarn so dyed is suitable for weaving with silk which has not been "boiled off," the goods being subsequently "boiled off" in the piece.

### After-treatment with Metallic Salts

Is carried out exactly in the same way as in the case of cotton, the same dyestuffs being used.

The dyeings after-treated with copper sulphate are worthy of note on account of their excellent fastness to light ; those after-treated with chrome alum are remarkable for their good fastness to water.

## The Pyrogene Dyestuffs on Silk.

The Pyrogene dyestuffs may be applied to silk in the same way as to wool, by a method introduced by us, particulars of which will be found under the paragraph " Pyrogene Dyestuffs on Half-silk."

# Acid Dyestuffs on Silk.

## Method No. 23.

The acid dyestuffs are also usually applied to silk in a broken " boiled off " liquor bath, and for this purpose sulphuric acid is generally added to the bath until it shows a distinctly acid reaction ; the Eosines and similar dyestuffs are applied in " boiled off " liquor bath acidified with acetic acid.

The goods are entered at 50° C., the dyestuff being added in several portions to the bath. The temperature of the bath is then brought to the boil and kept at that temperature for some time ; if necessary a further addition of acid is made during the course of the dyeing operation.

The silk is then washed and brightened with sulphuric or acetic acid.

Alkali Blue is dyed on silk according to the following recipe :—

## Method No. 24.

The silk is dyed with addition of 3—5 lbs. Marseilles soap per 100 gallons in a boiling bath.

It is then rinsed and soured in a fresh bath at 60—80° C., with 1½—5 °/₀ sulphuric acid 168° Tw. (D.O.V.)

In the souring bath the goods may be " topped " or shaded with other dyestuffs. In this case it is recommended to wash and brighten in a fresh cold sulphuric acid bath.

## Basic Dyestuffs on Silk.

### Method No. 25.

The basic dyestuffs are dyed similarly to the acid dyestuffs, but in a "boiled off" liquor bath containing acetic acid, or in a neutral soap bath ; just sufficient acetic acid should be added, in the former case, to render the bath slightly acid. The goods are entered at 40° C., and raised slowly to boil, the dyestuff being added in several portions during the operation. Dyestuffs which dye level at lower temperatures may be dyed at 60° C.

After dyeing, the silk is washed and brightened as usual.

As already stated, Eosine and Rhodamine are applied in a similar manner.

## The Mordant Dyestuffs on Silk.

As mordanting with chrome and other metallic salts comes into consideration only for alizarin colours and the dyewoods, whereas it is of minor importance for aniline dyestuffs, we omit a description of this method.

## Dyestuffs Soluble in Oil and Spirit on Silk.

Whereas the dyestuffs insoluble in water are scarcely ever applied to wool and cotton, they are of importance in silk dyeing in connection with the so-called "dry-dyeing" process. They are used principally, in this branch of the industry, in the dyeing of very light silk fabrics, point lace, gauze, and similar materials, which would be damaged by treatment in an ordinary dyebath. The process consists in treating the goods with a solution of the necessary dyestuff in alcohol or benzene. These solvents have no detrimental action on the structure of the fabrics, and quickly volatilize, leaving a thin layer of dyestuff on the goods.

Shades obtained in this way are by no means fast, but are generally sufficiently fast to fulfil the requirements of this class of goods.

## The Dyeing of Weighted Silk.

Among the many dyestuffs now on the market, only a limited number are suitable, on account of their good exhausting and easy levelling properties, for dyeing silk which has been heavily weighted with tin salts.

The dyestuffs indicated in the following table possess the useful property of dyeing perfectly level shades at a temperature of 50° C., so that the weighted silk suffers no loss in weight during the dyeing operation.

These dyestuffs, with the exception of Alkali Violet, are applied in "boiled off" liquor bath, with addition of sulphuric acid. The goods are dyed at 50° C., washed and brightened with acetic acid ; Alkali Violet is dyed in neutral soap bath at 50° C., washed and brightened with sulphuric acid.

The dyestuffs may be mixed for the purpose of producing compound shades.

# SILK DYESTUFFS

## ARRANGED ACCORDING TO THEIR FASTNESS AND APPLICATION.

## Dyestuffs suitable for Silk Dyeing.

### Basic Dyestuffs.

1 Auramine O, II.
2 ,, G.
1 Patent Phosphine G, GG.
1 Brllliant Phosphine 5 G.
1 ,, ,, 3 G, G.
2 Chrysoidine G, R
2 Bismark Brown G, R.
2 Diamond Magenta.
1 Rhodamine G, B, S.
2 ,, 6 G, 3 B.
2 Safranine G 000, B 000.
2 Cotton Scarlet G.
2 Cardinal Red G.
1 Violet B—4 B.
2 ,, (redder brands).
1 Crystal Violet 5 BO.
1 Ethyl Violet.
1 Brilliant Violet 6 B.
1 ,, ,, 8 B.
1 Methylene Blue G (mostly for topping purposes).
1 Victoria Blue 4 R.
1 ,, ,, R.
1 ,, ,, B.
1 Brilliant Victoria Blue RB.
1 New Victoria Blue GG.
1 Brilliant Glacier Blue.
1 New Fast Green 2 B.
1 ,, ,, ,, 3 B.
1 Fast Green JJO and O.
2 Jute Black N.
2 ,, ,, V, GN.

---

1 Fast to water (cold).

2 Fairly fast to water.

3 Fast to washing and milling (at 50° C. with 5 lbs. soap per 100 gallons).

4 Fast to washing and milling, but bleed slightly into cotton.

## Mordant Dyestuffs.

3—1 Chrome Fast Yellow G and GG }
3—1 Chrome Fast Black } chromed.

N.B.—The dyeings obtained with the basic dyestuffs, and the majority of the acid and direct colours, gain considerably in fastness to washing by steeping for several hours in 3—6 % tannic acid at 30—40° C.

## Acid Dyestuffs.

1 Tartrazine.
Quinoline Yellow.
2 Naphtol Yellow S.
Yellow WR.
2 Azo Yellow O, I.
Orange MNO.
,, N.
,, II.
2 Paper Red PSN, PE.
Acid Rhodamine R—RRR.
Ponceau S for silk.
1 Acid Violet 7 B—3 BO.
1 Amaranth G, B.
1 Kiton Red S.
Rocceline.
Benzyl Bordeaux B.
Alkali Violet I.
Alkali Blue 3 R—6 B.
Induline.
1 Pure Blue B for silk.
1 Navy Blue 5 R.
1 ,, RIII.
1 ,, RSP.
Night Blue.
Bleu Fluorescent.
Kiton Blue B.
1 Acid Green O, yellow shade.
Acid Green O, blue shade.
Kiton Green.
2 Wool Green S.
1 Grey R, B, BB.
Benzyl Green B.
Acid Brown G, R, B.
Resorcine Brown.
Acid Black NN.
,, HA.
Silk Acid Black.
Eosine JLI.
Erythrosine B.

---

1 Fast to washing.
2 Fairly fast to washing.
3 Fast to washing and milling (at 50° C. with 5 lbs. soap per 100 gallons).
4 Fast to washing and milling, but bleed slightly into cotton.

## Direct Dyestuffs.

3—1 Thiazol Yellow.
3—1*Direct Yellow CR, T.
4—1 Cotton Yellow CH.
3—1*Chlorantine Yellow JJ.
4—1 Chlorantine Yellow JG.
3—1 Fast Yellow R 1209.
4—1*Chlorantine Orange TR, TRR.
4—1 Direct Orange G, R.
3—1 Cupranil Brown G, R.
,, ,, B (coppered).
3—1*Chlorantine Brown B
,, ,, R, BB
4—1 Direct Brown *M, R.
3—1 ,, ,, V (developed).
4—1 Direct Safranine G, B
Direct Pink GN, BN.
4—1 Chlorantine Red, 4 B, 8 B.
3—1 Chlorantine Lilac B, BB.
4—1 Chlorantine Pink.
4—1 Direct Violet N.
4—1 Direct Blue 3 B, 2 B.
4—1 ,, ,, BX, 3 R.
4—1 Acetylene Blue 3 B.
4—1 ,, ,, BX, 3 R
4—1 Chlorantine Blue B, BB.
4—1 Direct Light Blue 550
3—1 Indigene Blue B, BB (developed).
4—1*Direct Sky Blue, green shade.
1*Acetylene Sky Blue.
3—1 Direct Green J.
,, ,, B 695.
4—1 Direct Grey.
3—1 Melantherine BH, HW developed (direct dyeings bleed).
3—1 Indigene Black B.
,, ,, HS (developed).

---

Dyestuffs marked thus * become much faster to milling and washing, if after-treated with 5—10 % chrome alum at 90—100° C.

1 Fast to water.

2 Fairly fast to water.

3 Fast to washing and milling (at 50° C. with 5 lbs. soap per 100 gallons).

4 Fast to washing and milling, but bleed slightly into cotton.

## Dyestuffs suitable for Dyeing Silk Yarn intended to be woven with raw silk, and "boiled off" in the piece.

The series of Pyrogene colours dyed according to our special method.

Melantherine BH (developed with β naphtol or resorcine).

Direct Blue 2 B (developed with β naphtol).

## Dyestuffs for heavily-weighted Silk (tin weighting).

Azo Yellow I.
,, ,, O.
Citranine 000.
Orange II.
,, R.
Acid Rhodamine R.
,, ,, RR.
Acid Violet 4 R.

Acid Violet 3 R.
Alkali Violet.
Brilliant Victoria Blue RB.
New Victoria Blue GG.
Victoria Blue 4 R.
Brilliant Glacier Blue.
Acid Brown G.
Benzyl Green B.

# The Dyeing of Artificial Silk.

# The Dyeing of Artificial Silk.

For the purpose of dyeing artificial silk the basic dyestuffs are chiefly employed; these are applied in very weak acetic acid bath, the goods being entered cold, and the temperature of the bath being raised to not more than 50° C. The goods are then rinsed and dried.

Acid and direct dyestuffs are similarly applied in acid bath; for pale shades with addition of acetic acid, for dark shades with addition of sulphuric acid, at 60—70° C.; however, the direct dyestuffs are also often dyed in neutral bath with addition of 10—20 lbs. Glauber's salt per 100 gallons at a temperature of 50° C.

The above instructions refer to the so-called Chardonnet (Nitro-cellulose) silk; Viscose silk (prepared according to the process invented by Cross and Bevan), may be dyed in the same way and with the same dyestuffs; it has, however, not such a great affinity for the dyestuffs, so that it is much easier to obtain level shades on this variety.

The new artificial silk manufactured by the Vereinigten Glanzstofffabriken A.-G. of Aachen may also be dyed with basic and direct dyestuffs; for the former it is necessary to mordant the goods 2—3 hours at 50° C. with—

$$\left.\begin{array}{l}2\text{—}5\ \%\ \text{Tannic Acid}\\ \quad 1\ \text{,,}\ \text{Hydrochloric acid, } 35^\circ\ \text{Tw.}\end{array}\right\}\ \begin{array}{l}\text{calculated on the}\\ \text{weight of the goods}\end{array}$$

after which they are carefully wrung out or squeezed off, and fixed for 15—20 minutes in a solution of

1—2½ % Tartar Emetic or Antimony Salt.

After washing, the goods are dyed in a fresh bath with the basic dyestuff, being entered cold, the temperature of the bath being afterwards raised to 30—40° C.

Direct dyestuffs are dyed for pale shades with—

{ 2 % Soap
{ 3—5 ,, Phosphate of Soda

for ½ hour at 30—40° C.

Medium and dark shades are dyed with—

{ 2 % Soda
{ 5—20 ,, Glauber's Salt

for ½—1 hour at 30—60° C.

The topping with basic dyestuffs and also the dyeing with Eosine dyestuffs is carried out in the same way as already indicated for cotton.

## Dyestuffs suitable for Artificial Silk.

### Basic Dyestuffs.

Auramine O, II, G
Brilliant Phosphine 5 G, 3 G
,, ,, G
Patent Phosphine G, GG, R
Chrysoidine G
Bismark Brown G, R
Safranine G 000, B 000
Rhodamine 6 G, B, S
Diamond Magenta

Cerise
Violet 3 R—4 B
Crystal Violet 5 BO
Ethyl Violet
Methylene Blue G
Fast Green O, I, JJO
New Fast Green 2 B, 3 B
Jute Black N, V, GN

### Acid Dyestuffs.

Particularly suitable for pale shades and for mixtures.

Azo Yellow O, I
Orange II
Rocceline

Acid Violet 3 BN, 4 BN, 7 B
Wool Green S
Grey R, B, BB

## Direct Dyestuffs.

Chlorantine Yellow JG
,, ,, JJ
Cotton Yellow C H
Chlorantine Orange TR
,, ,, TRR
Direct Orange G, R
Cotton Red 11 B 1436
Direct Safranine, G, B
Chlorantine Red 4 B, 8 B
Chlorantine Pink
Chlorantine Lilac R, B, BB
Direct Brown M
Cupranil Brown G, R, B
Chlorantine Brown R, B, BB
Chlorantine Lilac B, BB, R
Chlorantine Violet B, R
Acetylene Blue 3 R—6 B
Acetylene Pure Blue
Direct Sky Blue, green shade
Acetylene Sky Blue
Carbide Black S
Direct Green B 695
Direct Grey B, R

# Union Dyeing.

## (HALF WOOL).

# UNION DYEING.

As most of the various classes of colouring matters are applied together in union dyeing, it is not necessary to retain the former classification; we shall, therefore, disregard that method of classification entirely, and proceed to give in the following pages particulars of the various processes as carried out in practice for the dyeing of union fabrics.

Since it has been found possible to dye wool and cotton to the same shade with certain direct cotton colours in neutral Glauber's salt bath, these dyestuffs have assumed a position of tremendous importance in the dyeing of half-wool goods.

By employing the "one bath method," so called in contra-distinction to the older method of mordanting with sumac and iron, it is possible to obtain brilliant solid shades on union fabrics.

## The One-Bath Method for Unions.

### Method No. 26.

As already stated, the goods are dyed in one-bath, with addition of 10—20 lbs. Glauber's salt per 100 gallons; the bath should be kept as concentrated as possible, 15—20 times the weight of the goods, as in this way better results are obtained than in more dilute baths. Hard water should be corrected according to the degree of hardness with ½—1½ lbs. soda per 100 gallons, and in fact a slight excess of soda is not altogether a disadvantage.

It should be noted as an important rule, that the majority of the direct dyestuffs go more on to the wool, at the boil, than on to the cotton, whereas at lower temperatures the cotton takes up more dyestuff than the wool.

The method of procedure is as follows :—

The goods are entered at 60—70° C., dyed for ½ hour at this temperature, raised to boil during the next ¼ hour, and boiled until the wool is sufficiently dyed, which may take from ½—¾ hour boiling. Then the goods are sampled (bitted) ; if the cotton is too light more dyestuff is added, and the goods are allowed to run for some time in the cooling bath.

Attention should naturally be paid to the nature of the goods being dyed ; for instance, goods containing a large amount of cotton should be dyed at a lower temperature, say 60° C.

As already mentioned, a slight excess of soda (or other alkaline salt, such as borax, sodium phosphate, sodium silicate, etc.), has a beneficial effect, inasmuch as it prevents the dyestuff from going too much on to the wool ; for this reason the presence of acid, which often occurs in goods containing shoddy, should be avoided.

On the other hand, a large excess of soda should be avoided, as it impairs the strength and handle of the wool.

For this purpose direct dyestuffs are used, and chiefly those which have the property of dyeing the cotton the same shade or a deeper shade than the wool, and for the purpose of shading the wool such acid dyestuffs are employed as have the property of dyeing the wool in neutral bath without dyeing the cotton. Our various brands of Benzyl Blue and Benzyl Violet have proved particularly useful in this respect, and find extensive application in union dyeing.

We append a selection of other dyestuffs which are suitable for this purpose in the following tables.

In the dyeing of blue shades Alkali Blue is often used for the purpose of shading the wool ; in this case an addition of 2—4 lbs. borax or sodium phosphate per 100 gallons is made to the dyebath, as well as the usual quantity of Glauber's salt, and the goods are soured after dyeing.

The dyebaths may be used for further operations, and are replenished with $\frac{1}{5}$ of the original quantity of Glauber's salt, and $\frac{2}{3}$—$\frac{3}{4}$ of the original quantity of dyestuff.

By the same method, two-coloured effects (shots) can be obtained, by employing different dyestuffs for the wool and cotton, and in selecting the cotton dyestuffs, particular care should be taken to use only such colouring matters as dye the wool as little as possible ; however, these goods are usually dyed by the two-bath method, which we shall now proceed to describe.

## The Two-Bath Method for Unions.

### Method No. 27.

This method can be carried out in several different ways, as follows :—

1.—The cotton may be first dyed in a concentrated, weakly alkaline bath for $\frac{1}{2}$—$\frac{3}{4}$ hour at 40—60° C. with suitable direct colouring matters, the wool being afterwards dyed in a fresh acid bath with acid dyestuffs either lukewarm or boiling.

2.—The operations may be carried out in the reverse order, the wool being first dyed in boiling bath with acid dyestuffs, the cotton being afterwards dyed in a cold or luke-warm bath, with addition of $\frac{1}{4}$—$\frac{1}{2}$ lbs. soda per 100 gallons.

3.—An older method, which is still extensively employed, is as follows :—

The wool is first dyed in a boiling bath with acid dyestuffs ; after washing, the cotton is mordanted with tannic acid or sumac for 2—3 hours cold, fixed by passing through tartar emetic, and afterwards dyed cold or lukewarm with basic dyestuffs. This method is particularly suitable for the production of bright two-coloured effects, but is also much used for solid shades.

## Burl Dyeing.

The property, which the direct colours possess, of dyeing the cotton only in alkaline bath is often made use of in the so-called process of burl dyeing ; the necessary dyestuff is added to the hot milling liquor during the milling process. In this way any cotton bits (nops or burls) occurring in the woollen goods, which would otherwise show up in the finished goods as white spots, are perfectly covered.

The burl dyeing can also be conveniently carried out in the washing machine in a warm, slightly alkaline bath, which should be as concentrated as possible.

Our Carbide Black SO and E, and our Direct Deep Black 1718 are particularly suitable for burl dyeing.

# DYESTUFFS FOR UNION DYEING.

## Direct dyestuffs which dye the wool darker than the cotton in a neutral boiling Glauber's salt bath.

Cotton Yellow CH.
Direct Yellow CR 1746.
Acid Congo R.
Direct Pink GN, BN.
Direct Safranine G, B.
Cotton Red 4 B, 6 B.
,, ,, 10 B.
,, ,, 11 B, 12 B.
Chlorantine Red 4 B
,, ,, 8 B Wool rather yellower.
,, Pink
Direct Violet C, CB.
Direct Blue R Wool redder.
Acetylene Blue 3 R
Direct Blue W 104.
Direct Brown R.

By a suitable reduction of the temperature and by using a larger quantity of Glauber's salt (and in some cases by addition of a trace of soda), the above dyestuffs may be employed for the production of solid shades on union goods.

## Direct Dyestuffs which dye the wool and cotton alike in neutral boiling Glauber's salt bath.

Thiazol Yellow 2192
Direct Orange G
,, ,, R
Tolamine Violet } Wool redder.
Direct Blue B }
,, ,, BX
Acetylene Blue BX
Direct Blue R (wool redder)
Direct Sky Blue
Union Blue WG I
,, WG II
,, WG III
,, WG IV
Direct Indigo Blue A } Wool redder. With addition of acetic acid both fibres are dyed alike
,, BK }
,, BN }
,, BNK }

Direct Grey BR (wool redder)
Direct Brown M (very suitable)
,, ,, R
Cupranil Brown G (wool redder)
,, ,, R
Union Brown M
Direct Green B 695
,, ,, J
Direct Black 1602
,, ,, 1718
Carbide Black S
,, ,, E
Union Black K
,, ,, S 2050

### Direct dyestuffs which dye the cotton more than the wool in a neutral boiling Glauber's salt bath.

Chlorantine Yellow JJ, JG
Fast Yellow R 1209
Direct Yellow T
Chlorantine Orange TR
,, ,, TRR
Direct Grey 1474 }
,, ,, 1368 } Wool yellower.
Cupranil Brown B (wool slightly redder)
Chlorantine Brown R
,, ,, B
Chlorantine Brown BB
Direct Brown V
Direct Blue 2 B
,, ,, 3 B
Acetylene Sky Blue
Acetylene Pure Blue
Acetylene Blue 3 B, 6 B
Direct Light Blue 550
Direct Violet N
Melantherine JH

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### Acid dyestuffs which dye only the wool in neutral boiling bath, and which can therefore be used in the same bath with direct dyestuffs.

Yellow W R
Citronine 000
Orange MNO, R
Acid Rhodamine R—RRR
Rocceline
Benzyl Bordeaux B
Anthracene Red
Acid Brown G, B, V
Acid Violet 4 R, 3 BN
,, ,, 4 BN, 6 BN
,, ,, 7 B
Benzyl Violet 4 B, 6 B, 10 B
Benzyl Blue B, S
Alkali Violet O
Alkali Blue 3 R—6 B (must be subsequently soured)
Anthracene Acid Green
Wool Green S
Benzyl Green B
Fast Cloth Blue R, G, B
,, ,, ,, RB
Acid Black HA, 3 X
,, ,, NN
Benzyl Black B, 4 B

Rhodamine B is also useful for the purpose of covering the wool.

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## Direct Dyestuffs particularly useful for dyeing Union Skirt Bindings.

Direct Yellow CR 1746
,, ,, 2039
,, ,, T
Chlorantine Red 4 B
,, ,, 8 B
Direct Pink GN
,, ,, BN
A mixture of { 50 parts Acetylene Blue 6 B
50 parts Direct Blue W 104 }

Chlorantine Lilac B, BB
Direct Indigo Blue BN, BNK
,, ,, ,, A, BK
Cupranil Brown G, B
Union Brown M
Direct Black 1602
,, ,, 1718
Carbide Black E
Direct Green G 1574

### Directions for Dyeing.

The dyebath is prepared with the necessary dyestuff and 15—20 °/₀ Glauber's salt. The goods are entered at 60° C., worked at this temperature for 30 minutes, and then boiled for 20 minutes; in the case of Direct Yellow CR only 5—10 minutes.

Direct Yellow 2039 and T are boiled 20 minutes; then 2 % acetic acid is added, and the boiling continued for ¼ hour.

In the same way, Direct Indigo Blue A, BN, BK are boiled 20 minutes, then 2½—3 °/₀ acetic acid is added, and the boiling continued for ½ hour.

## Dyestuffs for Union Felts.

Chlorantine Yellow JG } together
Cotton Yellow CH }
Direct Yellow T
Direct Orange G, R
Acid Congo R 1573
Cotton Red 11 B, 1436
Chlorantine Red 4 B, 8 B
Direct Indigo Blue BN, BNK
,, ,, ,, A, BK
Union Blue WG I, WG II
,, ,, WG III
,, ,, WG IV
Direct Blue W 104 (for darkening the wool)
Melantherine HW
Direct Black 1602, 1718
Union Black K old
,, ,, S 2050
Direct Green B 695

## Directions for Dyeing.

The dyebath is prepared with the necessary amount of colouring matter and 30 lbs. crystallised Glauber's salt per 100 gallons. The goods are entered at 60° C., worked $\frac{1}{4}$ hour at this temperature, then boiled $\frac{3}{4}$—1 hour, and afterwards washed.

The duration of the dyeing at 60° C. is regulated according to the quantity of cotton contained in the goods ; the above directions refer to felt containing 40 °/o cotton ; felt containing a larger amount of cotton is dyed rather longer at the lower temperature.

The goods should be well scoured before dyeing.

# The Dyeing of Half-Silk.

# THE DYEING OF HALF-SILK.

As in the dyeing of half-wool, so in half-silk dyeing. There are two distinct methods of working, the one-bath method and the two-bath method; likewise the direct dyestuffs are also of considerable importance in the dyeing of this class of textile fabrics.

The methods of application for both wool and cotton unions and union fabrics composed of silk and cotton are very similar, and differ only in slight details according to the properties of the fibre which is woven with the cotton; for example, the quantity of Glauber's salt or common salt is reduced as much as possible, or in the case of pale shades is omitted altogether, as these salts have a detrimental action on the lustre of the silk, but, on the other hand, the bath is kept more alkaline, by addition of soda, soap, or sodium phosphate, than customary when dyeing unions of wool and cotton. The addition of soap is especially beneficial in preserving the lustre of the silk.

In half-silk dyeing it is not always usual to attempt to dye both fibres simultaneously to the same depth of shade, but the cotton is very often dyed as deep as possible in an alkaline bath, the silk being afterwards dyed to shade in a fresh bath.

## The One-Bath method for Half-Silk.

### Method No. 28.

Pale shades are dyed with—

2 —3 lbs. Soap, or
1½—3 ozs. Soda
1¼—2 lbs. Soap, or
¾—1¼ lbs. Sodium Phosphate
¾—1¼ lbs. Soap

per 100 gallons.

For darker shades the above quantities are employed, and, in addition—

4—6 lbs. common salt

per 100 gallons.

Common salt is more suitable than Glauber's salt for half-silk.

The goods are entered lukewarm, raised to boil, and dyed just below the boil for about ¾ hour, then the cotton is dyed by working some time in the cooling bath. If it is important that the silk should be well dyed, the addition of alkali is reduced.

For pale shades the dye liquors are not used again; for darker shades the liquor may be used for further operations by replenishing with ⅓—¼ of the original quantities. The bath should be kept as concentrated as possible.

If, as is the case with most dyestuffs, the silk is not sufficiently covered, it must be topped in a fresh bath with either basic or acid dyestuffs; the former dye the cotton somewhat, the latter not at all.

This operation is carried out with addition of 3—6% acetic acid (basic colours require less than acid colours) at 30—50° C. (basic colours at the lower temperature, sometimes even cold).

The diazotising and developing of direct dyestuffs also finds application in half-silk dyeing, as in this way very fine, deep, and fast dyeings are obtained; in this case, instead of dyeing in alkaline bath, the goods are dyed in slightly acid bath (with 1—2% acetic acid) at the boil, until the silk is sufficiently deep in shade, when it is diazotised and developed in exactly the same way as usual for cotton. In this way solid shades are produced; if the goods are dyed in alkaline bath the silk remains lighter than the cotton, and must afterwards be topped with basic or acid dyestuffs.

The circumstance that certain of the direct dyestuffs leave the silk quite white, renders it possible to produce 2-coloured effects (shot effects), the silk being afterwards dyed a different shade to that already dyed on the cotton, with acid dyestuffs.

In certain cases the dyeing of the cotton and silk for shot effects may be effected in one operation; the goods may be dyed, for instance, with a mixture of Alkali Blue and Chlorantine Yellow JG in a bath made alkaline by a slight addition of borax or sodium phosphate; they are then rinsed and soured.

Rhodamine B, G, 3 B, Rocceline and Azo Yellow I also dye the silk in alkaline bath.

## The Two-Bath method for Half-Silk.

### Method No. 29.

If particularly bright shades, not obtainable by the method above described, are required, the following method is employed. The silk is first dyed with the necessary acid or basic dyestuff, which leaves the cotton white. The latter is then mordanted with 4—10 % tannic acid (the amount varies according to the depth of shade required), for several hours cold, and afterwards fixed with half this quantity of tartar emetic and dyed in a fresh cold bath with basic dyestuffs.

As some of the basic colour in this operation goes on to the silk, it is necessary that caution should be observed in dyeing the silk during the first operation.

This method is equally suitable for the production of solid shades as for shot effects.

## The Pyrogene Dyestuffs on Half-Silk, also on Wool, Unions and all Silk Goods. (Patent applied for.)

As already remarked, we have been successful in working out a method, by which the Pyrogene dyestuffs, which, on account of their incomparable fastness, have attracted so much attention in the cotton dyeing industry, may be applied to the animal fibres and mixed fabrics without impairing their strength and other properties.

The method consists in replacing the strongly alkaline sodium sulphide bath, which has such a detrimental action on the wool and silk fibres, by the harmless ammonium sulphide.

As this cannot be obtained as a commercial article being of such an unstable nature, it is produced in the dyebath by the decomposition of sodium sulphide by ammonium salts.

We give below full particulars of the process as applied to half silk.

### Method No. 30.

| | |
|---|---|
| 100 | gallons water. |
| 30 | lbs. Half Silk. |
| 1½—6 | lbs Dyestuff. |
| 18 | lbs. Sodium Sulphide Cryst. |
| 3 | lbs. Solvay Soda. |
| 10—15 | lbs. Sal Ammoniac. |
| 5—15 | lbs. Dextrine. |
| 25—50 | lbs. Common Salt. |

The dyestuff is dissolved as usual with sodium sulphide and soda, and the solution is added to the dyebath together with the dextrine, then immediately before entering the goods the sal ammoniac is added. The common salt is added in several portions during the course of the operation.

The temperature of the bath should be 60—80 % C, and the duration of the operation about one hour.

The goods should be kept below the surface of the liquor, as far as possible, in order to prevent volatilization of the ammonium sulphide. and should also be worked under the liquor ; the best apparatus for this purpose is a large vat or jigger in which the rollers work under the surface of the liquor.

After dyeing, the goods are washed and finished in the usual way.

All the Pyrogene colours may be applied in this way ; in the case of the blacks, an after-treatment is not to be recommended, as it spoils the lustre of the silk, without improving the shade.

On the other hand, Pyrogene Blue R may be developed with hydrogen peroxide as on cotton ; Pyrogene Yellow M, Pyrogene Olive N and Pyrogene Brown may also be diazotised and developed.

Very fine blue shades are also obtained with Pyrogene Indigo Blue, New Pyrogene Direct Blue, and Pyrogene Navy Blue.

The dyeings obtained may be topped in a fresh bath with basic dyestuffs in the usual manner.

## Pyrogene Dyestuffs on Wool, Half-Wool and Silk.

Wool, half wool and all silk goods are dyed in the same way ; if the bath is too alkaline when dyeing wool, the quantity of sal ammoniac may be increased.

# Dyestuffs for Half-Silk.

## Direct Dyestuffs which in weakly Alkaline Bath dye the silk very little or not at all.

Chlorantine Yellow JJ & JG
Fast Yellow 1162
,, ,, R 1209
Direct Yellow T, TO
Chlorantine Orange TR, TRR
Chlorantine Red 4B, 8B
Chlorantine Pink
Direct Grey R, B, 1368, 1474
Chlorantine Lilac B
Direct Violet N (in pale shades)
Chlorantine Blue B, 2B

Chlorantine Pure Blue
Acetylene Blue 3B, 6B
Direct Blue B, 2B, 3B
Direct Sky Blue, green shade
Acetylene Pure Blue
Acetylene Sky Blue
Direct Light Blue 550
Direct Indigo Blue BN
,, ,, ,, BK
Melantharine BO 514
,, BH 678
,, RO 484
,, JH

## Direct Dyestuffs which dye the silk rather more, but yet not so dark as the cotton.

Thiazol Yellow
Cotton Red 10B
Direct Violet C, CB
,, ,, N (dark shades)

Direct Blue 3R } Silk paler
Acetylene Blue 3R } and redder.
Melantharine HW 615
Direct Brown M
,, ,, V (silk paler and yellower)

## Direct Dyestuffs which dye silk and cotton in Alkaline Bath to the same depth of shade.

Cotton Yellow CH
Direct Yellow CR 1746
Direct Orange G, R
Acid Congo R 1573
Cotton Red 12B 1733

Direct Pink BN, GN
Cotton Red 4B, 6B
Cupranil Brown B, R, G
Direct Green C, G, J
Half-silk Black

# Dyestuffs Suitable for Topping the Silk.

## (a) Acid Dyestuffs, applied in Acetic Acid Bath.

Naphtol Yellow S.
Azo Yellow I, O.
Orange II, R.
Amaranth G, B.
Rocceline.
Benzyl Bordeaux B.
Induline B.
Benzyl Violet 4 B, 5 B, 6 B, 10 B.
Acid Violet 3 BN, 6 BN.
Blue B for Silk.
Kiton Green.
Acid Green O, yellow shade
Acid Brown G, B.

## (b) Basic Dyestuffs, applied in either Neutral Soap Bath or weak Acetic Acid Bath.

Auramine O, II, G.
Patent Phosphine GG, G, R.
Brilliant Phosphine G, 3 G, 5 G.
Diamond Magenta.
Safranine G 000, B 000.
Chrysoidine G, R.
Bismark Brown G, R.
Rhodamine, G, B, S, 6 G.
Violet B, 3 B.
Crystal Violet 5 BO.
Methylene Blue G.
Victoria Blue B.

Rocceline, Azo Yellow, Rhodamine B, G and 3 B, Alkali Violet, and Alkali Blue, also dye the silk in alkaline bath, and may therefore be applied in the same bath simultaneously with direct dyestuffs; with Alkali Blue a subsequent souring is necessary.

# The Dyeing of Mixed Fabrics of Wool and Silk.

(GLORIA).

# THE DYEING OF UNION FABRICS OF WOOL AND SILK (Gloria).

## Direct Dyestuffs on Gloria.

### Method No. 31.

Those direct dyestuffs, which are suitable for dyeing solid shades on this class of goods, are best dyed in a concentrated bath with the simple addition of 5—20 lbs. Glauber's salt per 100 gallons, for ½ hour boiling, after which the dyeing is continued in the cooling bath in order to cover the silk.

The acid dyestuffs may be used both for dyeing solid shades and in the production of shot-effect; the particular dyestuffs used depending on the result required.

## Solid Shades on Gloria.

### Method No. 32.

For solid shades the goods are dyed in a fairly dilute bath (30—40 times the weight of goods) with addition of 5°/₀ sulphuric acid 168° Tw. The goods are entered cold into the dyebath, which contains only a portion of the necessary quantity of dyestuff, raised to the boil and kept at this temperature until the wool is dyed deep enough; then the bath is allowed to cool to 60—70° C., and the rest of the dyestuff is added and the dyeing continued for about ¼ hour, until the silk appears sufficiently covered.

In some cases it will be found necessary to dye the silk to shade in a weak acetic acid bath with basic dyestuffs at the ordinary temperature.

The usual method of producing shot-effects is as follows :—

## Shot=effects on Gloria.

### Method No. 33.

The wool is first dyed in boiling acetic acid bath for two hours, with such dyestuffs as dye the silk very little or not at all ; the goods are then washed.

For many purposes the silk will be clear enough ; if it is required still whiter, the dyestuff is stripped from the silk by working for 10—15 minutes in a boiling bath containing 1 pint ammonium acetate 16° Tw. per 100 gallons.

The silk is then dyed in a fresh luke-warm bath with basic dyestuffs, to the shade required.

The silk may also be cleared before dyeing with basic dyestuffs, by working for a short time in a luke-warm bath containing bran.

# Dyestuffs for Gloria which dye wool and silk to the same depth of Shade.

## Acid and Basic Dyestuffs.

Quinoline Yellow.
Azo Yellow O, I.
Chrysoine.
Orange MNO.
,, II.
,, N.
Ponceau S for silk.
,, 4161.
Anthracene Red.

Acid Rhodamine R—3 R.
Benzyl Bordeaux B.
Rocceline.
Rhodamine B.
Acid Violet (all marks).
Alkali Blue (all marks).
Victoria Blue B.
Benzyl Green B.
Wool Green S.

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## Direct Dyestuffs which dye in neutral Glauber's Salt Bath.

Cotton Yellow CH.
Direct Orange G, R.
Cupranil Brown B.
Direct Brown R 1804.
Chlorantine Lilac B, BB, R
Acetylene Blue 6 B.

Direct Light Blue 550.
Acetylene Pure Blue.
Direct Sky Blue, green shade.
Acetylene Sky Blue.
Carbide Black E.

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## Dyestuffs suitable for the production of shot effects, which dye silk very little, or not at all, or which are easily stripped off the silk.

Tartrazine.
Naphtol Yellow S.
Orange II.
Kiton Red S.
Ponceau S for silk.
,, 4161.

Amaranth G.
,, B.
Paper Red PSN.
,, ,, E.
Direct Pink BN.
,, ,, GN.

# The Dyeing of Straw and Straw-plait, Wood, Furniture and Matches.

# The Dyeing of Straw and Straw-plait.

## The Dyeing (Staining) of Wood, Furniture, and Matches.

### Method No. 34.

Straw is generally dyed with basic dyestuffs, in some cases also with direct dyestuffs; in order to effect a better penetration it is boiled with pure water containing 10% acetic acid reckoned on the weight of the goods, for two hours before dyeing with any of the dyestuffs included in the following tables. It is then dyed in a fresh neutral bath for two hours boiling.

Direct dyestuffs are dyed with addition of

$\left\{\begin{array}{l}20\%\text{ Glauber's Salt and}\\ 5\%\text{ Soap or }2\%\text{ Soda}\end{array}\right.$

for three hours at the boil.

Chip plait is dyed in a similar manner with basic dyestuffs in a neutral bath. Direct dyestuffs are also applied according to the method given for straw.

Wood is usually dyed chiefly with the basic dyestuffs; dyestuffs soluble in alcohol are also suitable for this purpose.

Matches are dyed in neutral boiling bath. For this purpose we would specially recommend,

Rhodamine B and G.
Fast Green O, J, JJO.

## Dyestuffs for Dyeing Straw and Straw-plait.

Auramine II, O, G.
Patent Phosphine G, GG.
Brilliant Phosphine 5 G, 3 G.
Brilliant Phosphine G.
Rhodamine 6 G, G, B, S.
Safranine G 000, B 000.
Chrysoidine G, R.
Bismark Brown G, R.
Catechu Brown.
Diamond Magenta.
Violet B, R, 5 BI.
Crystal Violet 5 BO.
Acid Violet 4 R.
Methylene Blue G.
Brilliant Victoria Blue RB.
New Victoria Blue GG.
Brilliant Glacier Blue.
New Fast Green 2 B, 3 B.
Fast Green O, JJO.
New Blue RS.
Straw Black 5093.
Direct Straw Black.

The above dyestuffs are particularly suitable on account of their covering powers and good penetrating qualities; as well as these, the following are also employed:—

Quinoline Yellow.
Cotton Yellow CH.
Direct Yellow CR.
Citronine 000.
Direct Orange G, R.
Ponceau S for silk, 4161.
Acid Congo R.
Eosine JLI, BI.
Erythrosine B.
Direct Pink BN, GN.
Direct Brown R.
Cupranil Brown B, R, G.
Rocceline.
Amaranth G, B.
Acid Violet 6 BN, 4 BN.
,, ,, 3 BN.
Water Blue CIII.
Pure Blue AAI, ARI, AI.
,, ,, BSI.
Direct Green B 695.
Grey R, B, BB.

# Dyestuffs for Dyeing (Staining) Wood and Furniture.

Auramine O
,, II
,, G
Brilliant Phosphine 5G
,, ,, 3G
,, ,, G
Patent Phosphine M
Chrysoidine G, R
Bismark Brown G, R
Safranine G 000
Safranine B 000
Violet B
,, R
Crystal Violet 5BO
Methylene Blue G
New Blue RS
Fast Green O
,, ,, I
,, ,, JJO

# The Dyeing of Vegetable Ivory and Horn Buttons, Feathers, Artificial Flowers, and Eggs.

## The Dyeing of Vegetable Ivory and Horn Buttons.

The dyeing of buttons is generally effected with direct dyestuffs; they are dyed with addition of 5—20 lbs. Glauber's salt per 100 gallons with a little soap for one hour boiling.

Basic dyestuffs are applied in neutral bath, in case of hard water, with addition of a little acetic acid for one hour at 40—50° C.

Vegetable ivory buttons are sometimes mordanted in a weak bath of tannic acid.

## The Dyeing of Feathers.

The feathers are first scoured by washing with ammonia or ammonium carbonate at 40—50° C, and afterwards dyed with acid or basic dyestuffs.

Acid dyestuffs are dyed with addition of 2—4 pints sulphuric acid per 100 gallons, for one hour at a temperature of 90—95° C, or for half hour at the boil.

Basic dyestuffs are applied without further addition at 40—50° C.

## The Dyeing of Artificial Flowers.

The flowers are immersed in a lukewarm solution of the requisite dyestuffs one or several times and dried in the air. Basic dyestuffs are mostly employed, occasionally also acid dyestuffs.

For silk flowers the dyestuffs are dissolved in a mixture of equal quantities of water and alcohol.

## The Dyeing of Eggs.

The boiled eggs are dyed by immersing in a warm, neutral solution of the dyestuff.

As particularly suitable for this purpose may be mentioned :—

Auramine II, O, G
Chrysoidine G, R
Bismark Brown G, R
Safranine G 000, B 000
Rhodamine 6 G, S, B
Eosine JLI
Erythrosine B
Violet 3B—3R
Crystal Violet 5BO
Victoria Blue 4R, B
Brilliant Victoria Blue RB
Methylene Blue G
New Blue RS
Fast Green O, I, JJO
Paper Black 3891
,, ,, N, V, S

# Leather Dyeing.

# LEATHER DYEING.

## The Dyeing of Oak and Sumac Tanned Leather.

The dyeing of oak and sumac tanned leather is generally carried out with basic dyestuffs; the acid dyestuffs are also used occasionally for this purpose. Thin leather is dyed by immersing in a lukewarm (40—50° C.) solution containing 1—2 lbs. dyestuff per 100 gallons; in order to avoid the unnecessary dyeing of the flesh side, two skins are generally dyed with the flesh sides laid together. Basic dyestuffs are applied in neutral bath; if the water is at all hard, it must be corrected by a slight addition of acetic acid. Acid dyestuffs are applied with addition of $\frac{1}{2}$ pint sulphuric acid 168° Tw. per 100 gallons.

Our various brands of Patent Phosphine are worthy of particular note on account of their excellent covering powers and level dyeing properties, which, combined with their low cost, have caused them to be universally adopted in the leather dyeing industry. As a shading dyestuff for the purpose of darkening colours obtained with these dyestuffs, we specially recommend our New Blue RS.

Thicker skins, particularly cow-hides, are often coloured by brushing over with a solution of the colouring matter. For this purpose a solution of 1—5 lbs. dyestuff (on the average 2 lbs.) per 100 gallons water is employed. The dry skin is three times brushed over with the solution of dyestuff at 30° C.

When dissolving Auramine the temperature of 60—70° C. should not be exceeded.

# The Dyeing of Chrome Leather.

Chrome-tanned leather, which has recently become of great importance, is dyed with basic, acid, and direct dyestuffs. For the first class of colouring matters the chrome leather must be first treated with a decoction of sumac; 3—4°/₀ sumac extract is usually sufficient.

The basic dyestuffs are also used for topping colours dyed on leather with acid and direct dyestuffs.

Direct dyestuffs are chiefly dyed neutral, only those which do not exhaust well being dyed with addition of a little acetic acid.

Acid dyestuffs are applied in acid bath, acetic acid or dilute sulphuric acid being used.

The leather is dyed for 10—15 minutes at 50—55° C.

After dyeing, the leather is washed well, stretched, brushed over with dilute glycerine and dried at a gentle heat. It is subsequently moistered with milk and water, dried, and then finished on the polishing machine.

# Dyestuffs for Oak and Sumac Tanned Leather.

## Basic Dyestuffs.

- Auramine O, II
- Patent Phosphine GG
- ,, ,, G
- ,, ,, GGMK
- ,, ,, M
- Brilliant Phosphine 5 G
- ,, ,, 3 G
- ,, ,, G
- Cinnamon Brown 1352
- Chrysoidine G
- ,, R
- Leather Brown A
- Fashionable Brown 1490
- Bismark Brown G
- ,, ,, R
- Diamond Magenta
- Russian Red, yellow shade
- ,, ,, blue shade
- Paper Scarlet G, B
- New Blue RS
- ,, ,, BS
- Methylene Blue G
- Fast Green O, I
- ,, ,, JJO
- Leather Black CI
- ,, ,, CII

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## Acid Dyestuffs.

- Naphtol Yellow S
- Quinoline Yellow
- Azo Yellow I, O
- Citronine OOO
- Orange II
- Acid Phosphine JO
- Acid Brown B
- Induline
- Grey R, B, BB
- Acid Green O, blue shade
- ,, ,, O, yellow shade
- Resorcine Brown

# Dyestuffs particularly suitable for Chrome Leather.

*Chlorantine Yellow JJ
*Azo Yellow O, I
Chrome Fast Yellow G
Cinnamon Brown GN
,, ,, RN
Cupranil Brown G
Chrome Fast Brown G
,, ,, ,, GG
*Anthracene Red I

*Chlorantine Red 4B
Acetylene Blue 3B
*Direct Olive I
* ,, ,, II
* ,, ,, III
Chrome Leather Black SN
,, ,, ,, GN
,, ,, ,, CS

Those marked with an asterisk (*) are applied with addition of five pints acetic acid per 100 gallons, the rest in neutral bath.

# The Fur Dyestuffs and their Application in Fur Dyeing.

# The Fur Dyestuffs and their Application in Fur Dyeing.

The fur dyestuffs are oxidation colouring matters; *i.e.*, chemical compounds which are easily oxidisable.

Furs are dyed by impregnating with a solution of the necessary fur dyestuff, and afterwards submitting to the action of some suitable oxidising agent.

The best oxidising agent for the purpose is hydrogen per-oxide in the form usually met with in commerce, namely a 12 volume per cent. solution.

Before a skin can be dyed it is absolutely essential that the hair should be freed from the fat which it contains, in order to effect a perfect penetration of the dyestuff. This degreasing process is known as "killing" the skin, and is carried out in one of the following ways:—

1.—By washing with 2 % soda solution for 1—2 hours cold, or

2.—By washing with 1 lb. soap and 1 lb. ammonia per 100 gallons for 1—2 hours, and afterwards rinsing with water, or

3.—By cleansing with a lime wash prepared as follows:—
 15 lbs. sal ammoniac (powdered)
 4¾ lbs. aluminium sulphate are dissolved in
  50 gallons hot water,

and to this solution is added milk of lime made by mixing 50 lbs. quicklime with 100 gallons water.

The solution so prepared is stored in well-stoppered earthenware vessels, and should be stirred before using.

The "killing" process is carried out by painting the hair side of the skin with this solution with a brush, the operation being repeated twice, or many times, according to the amount of grease contained in the goods; the skin is afterwards dried in a shady place, as direct sunlight and too intense heat rob the hair of its elasticity and make the leather hard. The chalk dust is removed from the dry goods by beating and brushing.

The goods freed from grease in this manner may now be dyed direct with the dyestuff, or they may be mordanted first with bichromate of potash and cream of tartar, in order to effect a saving of dyestuff and to assist the oxidising action.

### I.—Mordant for Pale Shades.

100 gallons water.
1 lb. Bichromate of Potash.
½ lb. Tartar.

### II.—Mordant for Medium Shades.

100 gallons water.
1¼ lbs. Bichromate of Potash.
¾ lb. Tartar.

### III.—Mordant for Dark Shades.

100 gallons water.
2 lbs. Bichromate of Potash.
1 lb. Tartar.

### IV.—Mordant for Black.

100 gallons water.
3 lbs. Bichromate of Potash.
1½ lbs. Tartar.

Instead of chrome and tartar mordant, the following may also be used for black :—

100 gallons water.
2 lbs. Ferrous Sulphate (copperas).
1 lb. Tartar.

With this mordant a greenish black is obtained.

The following mordant is also useful :—

100 gallons water.
2 lbs. Copper Sulphate (blue stone).
1 lb. Tartar.

The temperature of the mordanting bath should be about 15—20° C., and the duration of the process 3—4 hours, for darker shades 6—8 hours.

The chrome baths may be used for subsequent operations by using half the original quantities of chemicals ; but it is advisable to renew the baths entirely after using two or three times.

After mordanting, the goods are washed and entered into the cold dyebath.

A general recipe for dyeing cannot be given, the recipe for any particular kind of skin must be determined by experiment, as the concentration of the baths and the duration of the dyeing operation depend entirely on the quality of the skin. The following quantities may serve as a rough guide :—

For pale shades 1—1½ lbs. dyestuff per 100 gallons.

For dark shades 2—3 lbs., sometimes as much as 4 lbs., dyestuff per 100 gallons of water.

The skins are well soaked in this solution, being allowed to steep for 3—4 hours, then for every pound of fur dyestuff used 2½ gallons hydrogen peroxide is added to the bath, and the goods are allowed to steep with frequent stirring for a further period of 8—12 hours.

The darker the shade required, and the more perfect the degree of penetration, the longer the duration of the dyeing process.

Darker shades are considerably improved by exposing to the oxidising action of the air for two or three hours after dyeing, after which they are washed and dried at a gentle heat.

Of our three brands of fur dyestuffs, D, P and DB, D exhausts the quickest, giving shades from dark reddish brown to black. The P brand gives a yellowish brown, and the DB brand a navy blue and blue black. The various brands may also be applied in combination with one another, producing a range of useful shades.

The fur dyes are also suitable for producing coloured stripes on fur goods, and are particularly useful for shading "tails."

For this purpose a solution is used containing

1—2 lbs. Fur Dyestuff and
about 5 gallons Hydrogen Per-oxide

per 10 gallons. A single application gives a deep shade. If, however, this is not deep enough, a second application is given after 2—3 hours.

# Paper Dyeing
# and the
# Manufacture of Inks.

# PAPER DYEING.

For dyeing paper, basic, as well as acid and direct dyestuffs, find application. Usually the basic dyestuffs are employed for very brilliant shades, whereas the acid dyestuffs are used for such papers as require to be dyed especially fast to light. Paper is also often dyed with acid dyestuffs and then topped with basic colouring matters.

Among the direct dyestuffs, our Carbide Blacks have been found particularly useful for black and grey packing and needle papers; they give, moreover, a perfectly pure effluent, an important requirement in the paper industry.

They are applied in the usual way, the solution of dyestuff and the aluminium sulphate being added to the paper pulp, and the mixture allowed to run for some time in the beater after which the gum mastic is added.

For blotting papers, our direct dyestuffs have proved most suitable, applied without further addition.

For tinting note paper (for white), our various brands of Paper Blue and Pure Blue are excellently adapted; for paper intended for journalistic purposes (newspapers, etc.), our Brilliant Blue CR has proved most useful.

For paper-staining (manufacture of wall papers, etc.), those dyestuffs come chiefly into consideration which give clear solutions without sediment; most of our basic dyestuffs, the Pure Blues and many acid dyestuffs, such as Naphtol Yellow and Tartrazine, Orange MNO and II, Acid Magenta, Acid Violet, Eosin JL, Paper Red PSN and E, Grey RT and R, may be used for this purpose.

## Dyestuffs for Paper Dyeing.

Auramine O, II
Paper Yellow M T
Direct Yellow T
Orange MNO
,, II
,, R
Paper Orange M
,, ,, TN
,, ,, I
,, ,, II
,, ,, III
Chrysoidine G
,, R
Bismark Brown G
,, ,, R
Catechu Brown No. 5641
Brown No. 6712
Paper Red PE
,, ,, V
,, ,, PSN
,, ,, PSNR
,, ,, E
Safranine G 000
,, B 000
Paper Scarlet G
,, ,, R
Eosin JLI
Rhodamine S
,, G
,, 6 G
,, B

Rhodamine 3 B
Diamond Magenta
Violet 3 R—3 B
Brilliant Violet 6 B
,, ,, 8 B
Crystal Violet 5 BO
Ethyl Violet
Victoria Blue 4 R
,, ,, R
,, ,, B
Brilliant Victoria Blue RB
New Victoria Blue GG
Paper Blue 5R
,, ,, R
,, ,, RSP
,, ,, VII
,, ,, VI
Pure Blue BSI
,, ,, ARI
,, ,, I
,, ,, II
,, ,, AAI
,, ,, AI
,, ,, VIII
Green 5B
,, BP
Fast Green JJO
,, ,, O
,, ,, II
Grey R, sol. in water
,, B, sol. in water

## Dyestuffs for Paper Dyeing.—*Continued.*

Silver Grey RT
,, ,, BT
,, ,, III
,, ,, IV
Carbide Black RO
,, ,, RIOII
,, ,, C
,, ,, RJII

Carbide Black RTO
,, ,, RTJII
Paper Black GN
,, ,, N
,, ,, V
,, ,, S
,, ,, 3891
,, ,, 5093

## Dyestuffs for Blotting-paper.

Fast Yellow R 1209
Direct Yellow T
Direct Brown J
Cotton Red C
Acid Congo R
Direct Safranine G
,, ,, B
Chlorantine Red 4 B
,, ,, 8 B

Cotton Red 12B
Chlorantine Blue B
,, ,, BB
Direct Light Blue 550
Acetylene Pure Blue
Direct Green B 695
Direct Grey R
,, ,, B

# Dyestuffs suitable for Dyeing the Coloured Fibres (Jute or Cellulose) for Melange Paper.

*Safranine G 000
*  ,,  B 000
†Acid Congo R
*Diamond Magenta
*Rhodamine S
*  ,,  6 G
*  ,,  B
*Crystal Violet 5 BO
*Violet B
*Brilliant Violet 6 B
*Brilliant Violet 8 B
*Victoria Blue 4 R
*  ,,  ,,  R
*  ,,  ,,  B
*Brilliant Victoria Blue RB
*Fast Green JJO
*  ,,  ,,  O
†Carbide Black RO
†  ,,  ,,  RTO
†  ,,  ,,  C

## Method of Dyeing.

The jute or cellulose is dyed with about 1 % of the requisite dyestuff (those marked * with 5—10 % aluminium sulphate, those marked † with 10—20 % Glauber's salt) for $\frac{1}{2}$ hour boiling, after which the fibres are washed and added to the paper pulp.

## Dyestuffs suitable for Paper-staining.

### (For Wall-paper Printing, etc.)

Auramine O, II
,, G
Naphthol Yellow S
Tartrazine
Orange MNO
,, II
Patent Phosphine GG
,, ,, G
,, ,, R
Paper Red PE
,, ,, PSN
,, ,, E
Rhodamine 6G
,, S
,, G
,, B
,, 3 B
Safranine G 000
,, B 000
Amaranth G
,, B
Eosine JLI
Diamond Magenta

Violet 4 RN
,, 3 R
,, R
,, B
Crystal Violet 5 BO
Ethyl Violet
Acid Violet 4 RSN
Victoria Blue 4 R
,, ,, R
,, ,, B
Brilliant Victoria Blue RB
Paper Blue 5R
Pure Blue ARI
,, ,, AI
,, ,, BSI
Navy Blue RIII
New Fast Green 2B
,, ,, ,, 3B
Fast Green O
,, ,, JJO
Methylene Blue G
Silver Grey RT
Grey R, sol. in water

## Dyestuffs suitable for the manufacture of Ruling and Writing Inks.

Auramine O, II
,, G
Orange MNO
,, II
Rhodamine B
,, S
,, G
Eosine JLI
,, BI
Ponceau 4527
,, 4528
Erythrosine B

Amaranth G
,, B
Acid Violet 7 B—4 R
Pure Blue AI
,, ,, ARI
Violet 3 R—4 B
Crystal Violet 5 BO
Induline
Acid Green O, yellow shade
,, ,, O, blue shade
Fast Green O
,, ,, JJO

# The Precipitation of Colour Lakes
# and the
# Shading of Mineral Colours.

# The Precipitation of Dyestuffs in the form of Lakes, and the Shading of Mineral Colours.

## Recipe for Basic Dyestuffs.

10 lbs. Dyestuff are dissolved in
100 gallons water, and to the solution is added
50—200 lbs. Kaolin, and afterwards
10 gallons Tannin solution, $20^{\circ}/_{0}$, and
10 gallons Aluminium Sulphate, $20^{\circ}/_{0}$ solution,

filter, and dry.

Instead of aluminium sulphate, tartar emetic may be used as the precipitating agent, but the former is cheaper.

## Recipe for Acid Dyestuffs.

10 lbs. Dyestuff are dissolved in
100 gallons water, and into this solution is stirred
50—200 lbs. Kaolin, then
10 gallons Barium Chloride solution, $20^{\circ}/_{0}$, and
10 gallons Aluminium Sulphate solution, $20^{\circ}/_{0}$.

## Recipe for Alkali Blue, Pure Blue, Grey and New Solid Green 2 B and 3 B.

10 lbs. Dyestuff.
150 gallons water.
50—200 lbs. Kaolin.
6 lbs. Tin Crystals.
1 gallon water.

### Recipe for Resorcine (Eosine) Dyestuffs.

Dissolve 10 lbs. Dyestuff in
100 gallons water, and add to the solution
50—200 lbs. Kaolin, and
10 gallons Lead Acetate solution, 20°/$_o$.

### Recipe for Direct Dyestuffs.

Dissolve 10 lbs. Dyestuff in
100 gallons water, and add
50—200 lbs. Kaolin, and
10 gallons Barium Chloride solution, 20°/$_o$.

The precipitate is washed 2 or 3 times and pressed.

If the lake is required for lithographic printing, the Kaolin (or Blanc fixe) is replaced by aluminium hydrate paste; this is prepared as follows:—

### Aluminium Hydrate Paste.

(a) { 100 lbs. Aluminium Sulphate.
100 gallons water.

(b) { 35 lbs. Soda.
35 gallons water.

(a) and (b) are mixed and washed three times. This gives 260 lbs. aluminium hydrate paste.

For shading mineral colours, ochre, etc., dyestuffs of the greatest possible covering power are chosen, such as Ponceau, Paper Red, Solid Green, Violet, Methylene Blue, etc.; the aqueous solution of dyestuff is added to the mineral colour generally in the hydro-extractor, or during the cleansing operation; the dyestuff is frequently fixed by addition of a small quantity of barium chloride solution.

Methylene Blue G, on account of its fastness to the action of lime, is used as a colouring agent for Phosphates (Guano).

# Dyestuffs Soluble in Oil and in Alcohol.

## THE COLOURING OF SOAP AND SEALING WAX.

## Dyestuffs Soluble in Oil and in Alcohol.

The utility of these dyestuffs depends upon their solubility in the various solvents, concerning which properties full particulars are given in the following tables :—

Fat Orange No. 204 A,
Fat Ponceau LB,
Brilliant Fat Scarlet GN,
Brilliant Fat Black CN,

withstand carbon-disulphide and sulphur chloride, and on this account are suitable for the manufacture of rubber goods which must be subsequently vulcanised.

## The Colouring of Soap.

For dyeing soap, only those dyestuffs which are soluble in water, and withstand the action of alkalies, are applicable ; we append a list of dyestuffs suitable for this purpose.

## Solubility of our Dyest

| 100 Parts Solvent Dissolve | | Alcohol | Glycerine | Turpentine | Benzene | Petroleum | Vaseline | Paraffin |
|---|---|---|---|---|---|---|---|---|
| at a Temperature of | | 50° C. | 50° C. | 50° C. | 50° C. | 50° C. | 80° C. | 80° C. |
| FAT YELLOW | No. A | 15 | less than 1 | 3 | 13 | 2 | less than 1 | less than 1 |
| DO | ,, 2 A | 45 | insol. | 15 | 40 | 5 | ,, | ,, |
| FAT ORANGE | ,, 3 A | 8 | ,, | less than 1 | 4 | insol. | ,, | ,, |
| DO | ,, 4 A | 5 | less than 1 | 15 | 40 | 4 | 4 | ,, |
| FAT BROWN | ,, 5 A | 45 | insol. | 45 | 5 | 45 | insol. | insol. |
| DO | ,, 6 A | 18 | ,, | 15 | 40 | 5 | 5 | less than 1 |
| FAT ORANGE | ,, 7 A | 10 | less than 1 | less than 1 | 13 | less than 1 | 3 | ,, |
| DO | ,, 8 A | 10 | ,, | ,, | 13 | ,, | 3 | ,, |
| FAT PONCEAU | ,, 9 A | 5 | ,, | ,, | insol. | insol. | less than 1 | ,, |
| DO | ,, 10 A | 8 | ,, | ,, | ,, | ,, | ,, | ,, |
| FAT RED | ,, 11 A | 25 | ,, | ,, | 40 | less than 1 | ,, | ,, |
| DO | ,, 12 A | 12 | ,, | 6 | 6 | ,, | ,, | ,, |
| DO | ,, 13 A | 18 | insol. | 15 | 40 | 5 | 5 | ,, |
| FAT VIOLET | ,, 14 A | 45 | less than 1 | 20 | 20 | 8 | 14 | 15 |
| FAT BLUE | ,, 15 A | 45 | insol. | insol. | 40 | less than 1 | 3 | 12 |
| DO | ,, 16 A | 45 | less than 1 | less than 1 | 20 | ,, | less than 1 | less than 1 |
| DO | ,, 17 A | 25 | ,, | 45 | 10 | 4 | ,, | ,, |
| FAT GREEN | ,, 18 A | 30 | ,, | less than 1 | 13 | less than 1 | 5 | ,, |
| DO | ,, 19 A | 25 | ,, | insol. | 40 | ,, | less than 1 | ,, |

## ble in Oil in

| | Oleine | Boiled Linseed Oil | Rape Seed Oil | Cocoanut Oil | Olive Oil | Tallow | Wax | Spirit Varnish | Copal Varnish | Amber Varnish |
|---|---|---|---|---|---|---|---|---|---|---|
| | 50° C. | 50° C. | 50° C. | 50° C. | 50 C. | 80° C. | 80 C. | 50° C. | 50° C. | 50° C. |
| | 6 | 2 | 3 | 2 | insol. | 3 | 2 | 25 | 5 | 5 |
| | 20 | 25 | 14 | 25 | 5 | 35 | 12 | 50 | 17 | 25 |
| | 4 | 5 | 4 | 4 | less than 1 | 4 | 3 | 8 | 3 | 4 |
| | 12 | 17 | 14 | 14 | ,, | 12 | 12 | 8 | 16 | 10 |
| | 17 | 5 | 3 | 4 | ,, | 35 | 5 | 30 | 2 | 25 |
| | 12 | 18 | 4 | 15 | ,, | 35 | 10 | 17 | 12 | 25 |
| | 9 | 2 | 3 | less than 1 | insol. | 2 | less than 1 | 17 | 6 | 8 |
| | 9 | 2 | 3 | ,, | ,, | 2 | ,, | 17 | 6 | 8 |
| | 5 | 5 | less than 1 | ,, | ,, | 7 | ,, | 25 | 3 | 5 |
| 1 | less than 1 | less than 1 | 2 | ,, | ,, | less than 1 | ,, | 25 | 8 | 6 |
| | 16 | 15 | 5 | ,, | less than 1 | 5 | 2 | 30 | 9 | 16 |
| | 16 | less than 1 | 3 | ,, | ,, | less than 1 | 12 | 14 | 14 | 8 |
| | 12 | 18 | 4 | 15 | ,, | 35 | 10 | 17 | 12 | 25 |
| | 12 | 40 | 7 | 10 | 6 | 35 | 7 | 25 | 25 | 25 |
| | 25 | 8 | 7 | 10 | less than 1 | 35 | 35 | 50 | 25 | 25 |
| | 12 | 8 | 4 | 5 | ,, | less than 1 | 35 | 14 | 17 | 25 |
| | 17 | 15 | 5 | 4 | 5 | 35 | 35 | 25 | 25 | 25 |
| | 17 | 6 | 8 | 8 | insol. | insol. | 35 | 14 | 7 | 10 |
| | 17 | 18 | 5 | 8 | less than 1 | 35 | 35 | 17 | 25 | 25 |

## Solubility of our

| 100 Parts Solvent Dissolve | | Carbon Disulphide | Alcohol | Glycerine | Turpentine | Benzene | Petroleum | Vaseline |
|---|---|---|---|---|---|---|---|---|
| at a Temperature of | | 15° C. | 60° C. | 90° C. | 90° C. | 70° C. | 80° C. | 80° C. |
| Brilliant Fat Yellow | N | less than 1 | 2 | less than 1 | less than 1 | 6 | less than 1 | 5 |
| Brilliant Wax Yellow | II | ,, | less than 1 | ,, | ,, | 6 | ,, | 5 |
| Brilliant Fat Scarlet | GN | 5 | ,, | ,, | 10 | 20 | 3 | 6 |
| Do | BN | 2 | 2 | insol. | 6 | 20 | 2 | 4 |
| Fat Scarlet | BN | 2 | less than 1 | ,, | 5 | 10 | 3 | 4 |
| Brilliant Fat Bordeaux | N | insol. | insol. | less than 1 | less than 1 | less than 1 | insol. | insol. |
| Brilliant Fat Brown | GN | less than 1 | 3 | ,, | 10 | 2 | 3 | 5 |
| Do | RN | 2 | 3 | ,, | 5 | 4 | less than 1 | 6 |
| Do | BN | 2 | 3 | ,, | 1 | 6 | 3 | 5 |
| Brilliant Fat Black | GN | 3 | 20 | insol. | insol. | 20 | insol. | insol. |
| Fat Orange | LG | good | good | ,, | good | good | good | good |
| Do | LR | ,, | ,, | ,, | ,, | ,, | ,, | ,, |
| Fat Ponceau | LG | ,, | soluble with a little residue | ,, | ,, | ,, | ,, | ,, |
| Do | LB | ,, | | ,, | ,, | ,, | ,, | ,, |

The numbers in the columns show how many pa
given temperature. "Less than 1" denotes that one p
solvent, without being completely dissolved.

Those dyestuffs marked N and L are particula

## ble Dyestuffs in

| Stearine | Oleine | Boiled Linseed Oil | Rape Seed Oil | Cocoanut Oil | Olive Oil | Tallow | Wax | Spirit Varnish | Copal Varnish | Amber Varnish |
|---|---|---|---|---|---|---|---|---|---|---|
| 80° C. | 80 C. | 80° C. | 80° C. | 80° C. | 80° C. | 80° C. | 80° C. | 50° C. | 50° C. | 50° C. |
| 5 | 7 | 6 | 5 | 5 | 5 | 7 | 13 | 5 | 5 | 5 |
| 5 | 7 | 6 | 5 | 5 | 5 | 6 | 12 | 4 | 5 | 6 |
| 10 | 10 | 10 | 10 | 6 | 10 | 5 | 12 | 4 | 7 | 6 |
| 7 | 7 | 6 | 5 | 6 | 6 | 10 | 13 | 5 | 7 | 6 |
| 4 | 7 | 6 | 5 | 6 | 6 | 6 | 13 | 5 | 5 | 5 |
| less than 1 | less than 1 | less than 1 | less than 1 | less than 1 | insol. | less than 1 | less than 1 | less than 1 | less than 1 | 1 |
| 10 | 10 | 6 | 5 | 6 | 10 | 7 | 10 | 7 | 20 | 10 |
| 10 | 7 | 10 | 10 | 10 | 10 | 7 | 10 | 7 | 10 | 6 |
| 4 | 5 | 5 | 5 | 5 | 6 | 5 | 13 | 5 | 5 | 6 |
| 5 | 10 | insol. | insol. | insol. | insol. | insol. | 5 | 20 | insol. | 20 |
| good | good |  | good | good | good | good | good | good | good |  |
| " | " |  | " | " | " | " | " | " | " |  |
| " | " |  | " | " | " | " | " | " | " |  |
| " | soluble with difficulty |  | a little residue | a little residue | " | a little residue | a little residue | a little residue | a little residue |  |

the dyestuff are dissolved by 100 parts of solvent at the
the dyestuff gives a distinct colouration to 100 parts of

t to light.

# Solubility of the Spirit Dyestuffs in Spirit Varnish.

| 1½—3 lbs. per 10 gallons. | No. | Residue. | 1½—3 lbs. per 10 gallons. | No. | Residue. |
|---|---|---|---|---|---|
| SPIRIT YELLOW | 1 | none | SPIRIT YELLOWISH GREEN | 25 | trace |
| Do | 2 | little | SPIRIT GREEN | 26 | none |
| SPIRIT ORANGE | 3 | ,, | Do | 27 | ,, |
| Do | 4 | ,, | Do | 28 | trace |
| SPIRIT RED | 5 | trace | SPIRIT OLIVE | 29 | little |
| Do | 6 | none | Do | 30 | ,, |
| Do | 7 | ,, | Do | 31 | moderate |
| Do | 8 | ,, | Do | 32 | ,, |
| SPIRIT BLUE | 9 | ,, | SPIRIT ORANGE | 33 | trace |
| Do | 10 | little | Do | 34 | much |
| SPIRIT VIOLET | 11 | trace | Do | 35 | little |
| Do | 12 | little | SPIRIT RED | 36 | none |
| Do | 13 | trace | Do | 37 | trace |
| Do | 14 | ,, | SPIRIT BROWN | 38 | little |
| Do | 15 | ,, | Do | 39 | ,, |
| Do | 16 | little | Do | 40 | ,, |
| SPIRIT SCARLET | 17 | ,, | Do | 41 | trace |
| Do | 18 | ,, | SPIRIT RED | 42 | none |
| SPIRIT RED | 19 | none | SPIRIT BLACK | 43 | trace |
| Do | 20 | ,, | Do | 44 | ,, |
| SPIRIT VIOLET | 21 | trace | Do | 45 | little |
| Do | 22 | none | Do | 46 | trace |
| SPIRIT GREY | 23 | ,, | Do | 47 | ,, |
| Do | 24 | ,, | Do | 48 | little |

# Dyestuffs for Colouring Soap.

### Fast to Storing and Alkalies.

Cotton Yellow CH
Chlorantine Yellow T
,, ,, JJ
,, ,, JG
Orange N
,, MNO
,, II
,, R
Chlorantine Orange TR
,, ,, TRR
Acid Congo R 1573
Paper Red E
,, ,, PSN
,, ,, PE
Eosine JLI
Erythrosine B
Rhodamine 6 G
,, G
Rhodamine B
,, 5 G
Paper Scarlet G
,, ,, R
,, ,, B
Chlorantine Red 4 B
,, ,, 8 B
Chlorantine Pink
Cotton Red C
,, ,, 4 B
Chlorantine Blue B
,, ,, BB
Night Blue
Direct Green B 695
Acid Brown B
,, ,, G
Chlorantine Brown B
,, ,, BB

---

# Colours for Sealing Wax.

Brilliant Fat Yellow N
Brilliant Wax Yellow N
Fat Orange No. 4 A
Fat Red No. 9 A
,, No. 10 A
,, No. 11 A
Fat Red No. 12 A
Fat Blue No. 16 A
Green for Sealing Wax I
,, ,, II
(should be previously dissolved in alcohol)

# Cotton Printing.

## Cotton Printing.

In printing, the two methods which come chiefly into consideration are :—

1. Direct printing.
2. Discharge and resist printing.

We will, therefore, first treat with the method of direct printing as applied to the basic dyestuffs, one of the most important branches of the calico printing industry.

### Printing with Basic Dyestuffs.

In preparing the printing pastes it is necessary to exercise a considerable amount of caution in the choice of a thickening agent. For pale shades, the best results are obtained with a gum thickening, which, besides producing a paste of convenient consistency for printing, possesses very little colour and is easily removed from the goods after printing ; for darker shades, an acid starch paste, starch-tragacanth, or burnt starch thickening is preferable. These are usually employed for the deepest shades, although the prints so produced do not approach in clearness those obtained with gum thickening.

The necessary dyestuffs are dissolved in acetic acid 8—12° Tw., or in a mixture of acetic acid and water, the solution is filtered through a coarse cloth into the cold thickening, stirred well, and the necessary amount of tannin required to fix the dyestuff is added to the mixture in the form of a solution in acetic acid or water.

The following recipe furnishes a useful starch-tragacanth thickening :—

40 lbs. Wheat Starch, mix with
5 gallons water, then add
11 gallons water,
25 lbs. Tragacanth solution, 65/1000
3½ gallons Acetic Acid, 12° Tw.

Boil together.

To every 2 parts of this thickening, or of gum solution 1 in 1, one part of dyestuff and tannin solution is added.

The consistency of the printing paste is regulated according to the nature of the pattern to be printed (whether of bold or fine design), and according to the nature of the engraving on the printing rollers ; lightly engraved rollers and small patterns usually require thicker printing pastes than more deeply engraved rollers and bolder designs.

In most cases, an addition of some stable organic acid is made to printing pastes containing basic dyestuffs ; this acts as a solvent for the dyestuff, and also prevents the premature precipitation of the colour-lake, thereby considerably increasing the brilliancy of the print obtained.

Tartaric acid is generally employed for this purpose, from $\frac{1}{4}$—$\frac{1}{5}$ oz. being used for every pound of the printing paste ; quite recently, commercial lactic acid (50%) has been introduced as a substitute for tartaric acid, and is often applied for this purpose.

In the case of dyestuffs soluble with difficulty, other additions are employed to assist the solvent action of the acetic acid ; for example, ethyl tartrate, which decomposes on steaming into alcohol and tartaric acid, effects a perfect distribution of the dyestuff in the printing mixture. Acetine and laevulinic acid, which are similarly applied, act in a similar manner.

In the case of dyestuffs which are very difficult to dissolve, where the amount of acetic acid necessary to effect solution would be excessive, it is usual to boil the dyestuff with the thickening; it may also be here mentioned that with all other dyestuffs and printing pastes this is the method generally employed.

The method of working is as follows :—

| | |
|---|---|
| 3—5 | ozs. Dyestuff, |
| 1—3 | lbs. Acetic Acid 12° Tw., |
| 1—1½ | Starch, |
| $\frac{1}{10}$ | pint "Tournant" Oil, |
| ½ | gallon water, are boiled together, when cold the following are added— |
| 1—2 | pints Tannin Acetic Acid, 1/1, |
| 2½ | ozs. Tartaric Acid (powdered), |
| — | water up to |
| 10 | lbs. |

The tartaric acid should on no account be boiled with the starch, as this would render the paste too thin; it should always be added to the printing paste when only warm or cold. The addition of "tournant" oil (castor oil or glycerine may also be used) increases the tractability of the printing paste, and causes it to work better into the engraving on the printing rollers.

The printing paste is passed through a sieve or sack of thick cotton material before using, in order to remove any grains of sand and other impurities which might injure the printing rollers and doctors.

The quantity of dyestuff required per 10 lbs. printing paste varies according to the concentration of the colouring matter, the desired shade, and the depth of the engraving on the printing rollers. Whilst for pale shades occasionally as little as $\frac{1}{6}$—$\frac{1}{3}$ oz. is sufficient, for dark shades 5—6 ozs. per 10 lbs. printing paste is required; in the case of very concentrated dyestuffs, such as Rhodamine 6 G, 2 ozs. is sufficient for the deepest shades.

According to the solubility of the dyestuff, an addition of 1—3 lbs. acetic acid per 10 lbs. printing paste is made, a sufficient quantity being added to keep the lake, formed by combination of the tannin and the dyestuff, in a state of solution; the amount of tannin necessary is regulated according to the quantity and concentration of the dyestuff, and also according to the thickening. In most cases 2—3 times the weight of the dyestuff of tannin is employed; for blues and greens as much as 4 times the weight of the dyestuff is used.

In order to use concentrated printing pastes for paler shades, they are diluted with the ordinary thickening, in any required proportions.

For example:—

1 part printing paste, containing 3 ozs. colour,
per 10 lbs.
2 parts thickening

gives a diluted printing paste containing 1 oz. colour per 10 lbs.; but it should be noted that the thickening also absorbs a certain amount of tannin; a printing paste prepared with starch requires a larger addition of tannin than one thickened with gum.

The most convenient way of using tannin is in the form of an acetic acid solution (5 lbs. per gallon); an addition of $\frac{1}{2}$—1 pint glycerine per 10 lbs. renders the solution more stable.

With some dyestuffs, which are easily reduced on steaming, *e.g.*, New Blue RS and BS, an addition of $\frac{1}{6}$—$\frac{1}{3}$ oz. sodium chlorate is advantageous.

Many dyestuffs, such as the Victoria Blues, give more brilliant results when printed on cotton which has been previously prepared with 3—5% turkey red oil; usually this preparing with turkey red oil is only resorted to when basic dyestuffs are being simultaneously applied with Alizarin dyestuffs.

After printing and drying, the goods are passed through the Mather-Platt, in order to remove the acetic acid vapour, and afterwards steamed for 1 hour without pressure, or at a pressure of $\frac{1}{4}$—$\frac{1}{2}$ atmosphere.

By the steaming process the acetic acid is driven off, and the colour-lake is rendered insoluble; in order to render the print absolutely fast to washing, the printed goods are passed in the open width through a bath containing:—

$$\begin{cases} \text{3—6 lbs. Tartar Emetic or Antimony Salt and} \\ \text{0—3 lbs. Chalk} \end{cases}$$

per 100 gallons, at a temperature of 40—70° C.

The amount of tartar emetic varies according to area of printed surface, the temperature according to the fastness of the dyestuff. The goods are well washed, and afterwards soaped, cold or warm, generally about 40—60° C., according to the nature of the dyestuff, with 3—5 lbs. Marseilles soap per 100 gallons, for half-an-hour. The operation being repeated if necessary.

The thickening should be entirely removed during this soaping process, in order to show up the colour to the best advantage. Starch thickening is particularly difficult to remove, and makes the goods stiff; on this account it is often necessary to treat the goods for 15—30 minutes at 40° C., in a bath containing 5—10 lbs. ground malt per 100 gallons, in order to convert the starch on the fibre into soluble dextrine.

If the white is still not satisfactory, the goods are passed through a chlorine solution, the strength of which varies from $\frac{1}{4}$—$\frac{1}{2}$° Tw., depending on the colour of the white and on the fastness of the dyestuff to the action of chlorine. They are then dried and finished.

Certain basic dyestuffs may be more advantageously applied on oil mordanted goods, with the addition of acetate of chrome; the shades so obtained are more brilliant if not so deep as those produced with tannin.

Such are

Victoria Blue B, RB and 4 R, and
Rhodamine S, B, 3 B, G and the extra brands.

2½ ozs. Dyestuff dissolved in
2 pints water,
1 pint Acetic Acid,
6 lbs. Starch Tragacanth thickening, to this mixture
1 lb. Acetate of Chrome, 32° Tw.
10 lbs.

Steam 1 hour, wash, soap at 40° C., wash.

## Printing with Acid, Resorcine, and Similar Dyestuffs.

The acid and eosine dyestuffs, on account of their inferior fastness to washing, find but a limited application in cotton printing; they are chiefly used for unwashable (export) goods.

The Water Blues and Pure Blues are fixed mostly with tannin, in some cases also with acetate of chrome and with albumen; the acid dyestuffs proper and the Eosines are usually fixed with aluminium acetate, sometimes with addition of acetate of magnesia.

A typical recipe is as follows :—

2½ ozs. Ponceau 4528 or Paper Red PSN,
— water,
6 lbs. Starch Tragacanth thickening,
1 pint Acetate of Alumina, 23° Tw.,
¼ pint Acetate of Magnesia, 52° Tw.
10 lbs.

Steam, and without washing, finish on the back side.

# The Mordant or Chrome Dyestuffs.

The mordant dyestuffs introduced by us are almost without exception fixed by means of acetate of chrome. Amongst the most important of these are the various brands of Gallocyanine, which find extensive application in cotton printing. Of these our DH and BS brands are chiefly used for printing, whilst the SR brand is employed more for dyeing purposes.

Printing recipe for Gallocyanine paste :—

| | |
|---|---|
| 1½—3 | lbs. Gallocyanine, 10 % paste. |
| ½—¾ | pint Acetic Acid. |
| — | water. |
| 5 —6 | lbs. Starch Tragacanth thickening. |
| ¾—1 | pint Acetate of Chrome, 32° Tw. |
| 10 | lbs. |

The goods, which have been previously prepared with oil, are printed with the above paste, steamed under slight pressure, passed through a bath containing 5 lbs. chalk per 100 gallons at 70—80° C, washed and soaped.

Our mordant dyestuffs proper, such as Chrome Fast Yellow G and GG and Chrome Fast Brown B, R and G, are applied in exactly the same way ; the former produce prints of excellent fastness, and may be used simultaneously with alizarine dyestuffs.

From 5—7 ozs. of colour per 10 lbs. printing paste is the amount generally used, and this is fixed with three times its weight of acetate of chrome 32° Tw., in some cases with addition of a little calcium acetate.

## Bleu d'Alsace G and GO.

Our Bleu d'Alsace G and GO, which are universally employed on account of their brilliant shades, are fixed in a similar manner with acetate of chrome.

They are printed according to the same process as Gallocyanine, but require a lower temperature in the chalk bath.

### Noir CN and C 20.

Amongst these dyestuffs may be mentioned our two brands of reduced black under the names of Noir CN and C 20. These are applied according to the following recipe :—

| | |
|---|---|
| 2—2¾ | lbs. Noir CN or C 20. |
| 6—5⅕ | lbs. thickening. |
| ½ | pint Acetic Acid, 12° Tw. |
| ¾ | pint water. |
| 1 | pint Acetate of Chrome, 32° Tw. |
| ⅓ | oz. Sodium Chlorate. |
| 10 | lbs. |

The reduced black (Noir reduit) may also be boiled with starch, tragacanth, water and acetic acid.

## Printing with Pyrogene Dyestuffs.

The Pyrogene dyestuffs find application in cotton printing in the production of grey, brown and olive shades, which are remarkable for their excellent fastness to light and washing.

Grey prints obtained with Pyrogene Black possess the great advantage over the otherwise fast Alizarine Black, that they do not become brown by the action of sulphurous acid (which occurs in rooms in which gas is burnt),

The printing pastes may be shaded with Alizarine dyestuffs and Gallocyanine.

The method of printing is as follows :—

| | | |
|---|---|---|
| 2½—12 | ozs. Pyrogene dyestuff. | Allow to stand one day. |
| ¼—1½ | pints Bisulphite, 72° Tw. | |
| 3 | lbs. British Gum or burnt Starch. | |
| — | water,—boil and add | |
| ¼—1½ | pints Acetate of Chrome, 32° Tw. | |
| 10 lbs. | | |

The printing paste may of course be prepared with other thickening agents. After printing the goods are steamed, washed and soaped hot.

## Pyrogene Dyestuffs in Hand, Perrotine and Yarn Printing.

On account of the sodium sulphide which they contain, the Pyrogene colours are not suitable for use on the ordinary roller printing machines; excellent results are obtained with them, however, in hand printing and in the printing of yarn, where wood or lead blocks or rollers are employed.

The printing paste is prepared with 2—12 ozs. colour per 10 lbs., thickened with British Gum, and a little sodium sulphide and caustic soda. The goods, after printing, are steamed ¼ hour, washed or chromed in a hot bath.

## Printing with the Direct Cotton Dyestuffs.

Although not very fast to washing, the direct dyestuffs are used for many purposes, particularly for printing cotton linings. In the case of those dyestuffs which require the presence of alkali to effect perfect fixation, the printing paste contains, besides the dyestuff, the necessary amount of some alkali, such as silicate of soda, borax or phosphate of soda. In the case of dyestuffs which do not require alkali to effect fixation, such additions are unnecessary; however, both classes are usually applied together.

As a thickening agent starch tragacanth paste or British gum is employed.

The printed goods are steamed at a moderate pressure, and then washed or finished immediately on the back side.

A printing paste of this type is prepared as follows :—

| | |
|---|---|
| 5 | ozs. Dyestuff. |
| 3 | ozs. Borax. |
| ½ | gallon water. |
| 6 | lbs. Starch Tragacanth Thickening. |
| 10 lbs. | |

If instead of the starch tragacanth paste, a thickening agent which runs (*e.g.*, gum tragacanth) be employed, the printing of the cotton velvet goods now in vogue can be cheaply carried out, and by combining this with a paste which does not run, very fine effects can be obtained.

### Printing with Albumen or Caseine.

Prints of better fastness to washing are obtained if albumen is added to the printing paste. During the steaming operation the albumen coagulates and effects a better fixation of the dyestuff.

$\frac{1}{3}$ oz.—3 lbs. albumen per 10 lbs. printing paste may be added, the paste being prepared with any kind of thickening, according to choice. The albumen is added in the form of a solution 1/1. For pale shades egg albumen should be used ; for darker shades the cheaper blood albumen may be employed.

For still cheaper goods, especially for cotton linings, the albumen is replaced by a solution of caseine consisting of—

| | |
|---|---|
| 2 lbs. Caseine.<br>14 pints water.<br>2 pints Ammonia. | The mixture is allowed to stand for 1 day. |

After printing the goods are steamed $\frac{1}{4}$ hour, washed and dried.

# Dyestuffs for Direct Cotton Printing.

## Basic Dyestuffs (to be fixed with Tannin).

Those dyestuffs marked with an asterisk (*) may also be printed with acetate of chrome.

Auramine O, II
,, G
*Brilliant Phosphine 5 G
* ,, ,, 3 G
* ,, ,, G
Patent Phosphine M
Bismark Brown G } Not very fast to washing.
,, ,, R
Diamond Magenta
Cerise
Rhodamine 6 G } And the corresponding extra brands.
* ,, B
* ,, G
* ,, 3 B
* ,, S
Safranine G 000
,, B 000
Violet 4 B—3 R

Crystal Violet 5 BO
Ethyl Violet
Soda Violet
Brilliant Violet 6 B
,, ,, 8 B
New Blue RS } With chlorate in printing paste.
,, ,, BS
Fast Blue MD
Methylene Blue D
*Victoria Blue 4 R
,, ,, R
* ,, ,, B
*Brilliant Victoria Blue RB
New Victoria Blue GG
Brilliant Glacier Blue
New Fast Green 3 B
,, ,, ,, 2 B
Fast Green O, I, JJO

## Dyestuffs which are fixed by means of Acetate of Chrome.

Chrome Fast Yellow G
,, ,, ,, GG
Bleu d'Alsace G
,, ,, GO
Gallocyanine DH
Gallindone N
Gallocyanine BS
,, SR
Noir CN
,, C 20

### Acid Dyestuffs and similar colouring matters suitable for the production of Prints of Inferior Fastness to Washing.

Orange II
,, R
Ponceau S, for silk
,, 4161
Paper Red PSN
,, ,, E
Pure Blue AAI
,, ,, AI
,, ,, ARI
,, ,, ASI
Eosine JLI
Erythrosine B

## Pyrogene and Thiophenol Dyestuffs suitable for Direct Printing.

Thiophenol Black T extra
,, ,, 2 R, extra
Pyrogene Indigo Blue paste
Pyrogene Direct Blue red shade

# Direct Cotton Dyestuffs suitable for Cotton Printing.

Chlorantine Yellow JJ
,, ,, JG
Direct Yellow T
,, ,, CR
Cotton Yellow CH
Direct Orange G
,, ,, R
Chlorantine Orange TR
,, ,, TRR
Cotton Red 4 B
,, ,, 6 B
,, ,, 10 B
,, ,, 11 B
,, ,, 12 B
Direct Pink BN
,, ,, GN
Direct Safranine G
,, ,, B
Chlorantine Red 4 B
,, ,, 8 B
Cupranil Brown G
,, ,, R
,, ,, B
Chlorantine Lilac B
Chlorantine Lilac BB
,, ,, R
Acetylene Blue 3 R
,, ,, BX
,, ,, 3 B
,, ,, 6 B
Direct Indigo Blue BN
,, ,, ,, BNK
,, ,, ,, BK
,, ,, ,, A
Direct Blue 907
Direct Light Blue 550
Acetylene Sky Blue
Cotton Blue N
,, ,, NN
Opaline 5 G
,, 2 G
Direct Green B 695
,, ,, J
,, ,, 1574
Direct Black 1718
,, ,, 1602
Carbide Black RI

# Discharge and Resist Printing on Cotton Piece Goods.

In the following pages we shall describe the most important methods of discharge and resist printing which come into consideration for our dyestuffs.

## Dyeing on Caustic Discharged Tannin Ground.

This method serves for the production of white patterns on goods which have been dyed with basic dyestuffs, and in spite of the fact that it is one of the oldest methods, and although it is not possible in this way to obtain coloured discharges, it is still frequently employed, as the whites obtained thereby are remarkably fine and clear. The goods are prepared on the hot flue with a solution containing 10—50 lbs. tannin per 100 gallons, according to the depth of the shade required, and dried. They are then passed in the open width through a bath containing

30 lbs. Tartar Emetic,
30 lbs. Chalk,
50 lbs. Sal Ammoniac or Common Salt

per 100 gallons, at a temperature of 60—70° C. (for the weaker tannin mordant half this quantity suffices), washed and dried.

They are then printed with the caustic soda discharge given below, sometimes also with aniline black, dried hot, passed through the Mather-Platt, and afterwards passed in the open width through dilute acetic acid, or through a bath containing

6—8 lbs. Sal Ammoniac } per 100 gallons
5—10 lbs. Gum }

at a temperature of 40—50° C., and then washed well.

### Caustic Soda Discharge.

| | |
|---|---|
| 1¾ | lbs. Starch, made into a paste with |
| 5 | pints water, to this is added |
| 11 | pints Gum Solution 1/1, and |
| 10 | pints Caustic Soda 75° Tw. |

After passing through dilute acetic acid or sal ammoniac bath as described above, the goods are dyed either in the open winch machine or in the jigger, with addition of

| | | |
|---|---|---|
| 10—20 lbs. | Acetic Acid | per 100 gallons, |
| 1— 2 lbs. | Alum | |
| 20—40 lbs. | Common Salt | |

the temperature being raised from cold to the boil (except in the case of Auramine, which should not be dyed above 70° C.) ; they are then washed and soaped two or three times at 30°C.

### Caustic Soda Discharges on Goods already Dyed.

Certain dyestuffs, such as

Auramine } All brands,
Violet } All brands,
Solid Green } All brands,
Brilliant Glacier Blue,
New Solid Green 2 B and 3 B,

may be discharged direct with the above caustic soda discharge. This method, however, is less frequently employed than the one already described.

# Basic Dyestuffs suitable for Dyeing on Caustic Discharged Tannin Ground.

Auramine O, II
,, G
*Brilliant Phosphine G
* ,, ,, 3 G
* ,, ,, 5 G
Safranine G 000
,, B 000
Rhodamine 6 G
,, 5 G
Diamond Magenta
Cerise
Violet 3 R—3 B

Crystal Violet 5 BO
Soda Violet
Ethyl Violet
New Blue BS
,, ,, RS
*Fast Blue MD
*Methylene Blue G
Brilliant Glacier Blue
New Fast Green 3 B
,, ,, ,, 2 B
Fast Green O, I
,, ,, JJO

Those dyestuffs marked with an asterisk (*) do not give a perfect white, but are nevertheless useful in some cases.

## Discharging with Potassium Sulphite.

A method very similar to the one already described, which, however, is also applicable in the production of coloured discharges, is discharging with potassium sulphite.

It depends upon the fact that during the steaming operation potassium sulphite destroys many basic dyestuffs, whereas it has no action on others, and in addition it does not attack the tannin mordant. The method of working is as follows:—

The goods, which have been previously mordanted with tannin and dyed with basic dyestuffs, are printed with the white discharge or coloured discharge given below, and also in some cases with aniline black. They are then passed through the Mather-Platt, and afterwards through dilute acetic acid, washed and dried.

### Discharge A.

8 lbs. Potassium Sulphite (powdered)
2 gallons water
10 lbs. Burnt Starch
} Dissolved together.

### Coloured Discharge.

3—8 ozs. Dyestuff.
1½ pints water.
3—3½ lbs. Gum Solution or Dextrine Thickening.
4—5 lbs. Discharge **A.**
½ pint Caustic Soda 76° Tw. (only for Direct dyestuffs).

10 lbs.

The white discharge is prepared in the same way as the coloured discharge, if anything more concentrated, and contains ½ pint caustic soda per 10 lbs. discharge paste, but, of course, no dyestuff.

## Dyestuffs Dischargeable with Potassium Sulphite.

Those dyestuffs marked thus (*) can only be discharged with *alkaline* sulphite discharge.

*Auramine O, II, G
*Rhodamine 6 G, B, 5 G, 3 B
*Diamond Magenta
*Violet (all brands)
*Crystal Violet 5 BO
*Ethyl Violet
*Brilliant Glacier Blue
Pure Blue
*New Fast Green 2 B, 3 B
Fast Green JJO, O, I

---

## Dyestuffs which may be added to *Neutral Potassium Sulphite Discharges* for the production of Coloured Effects.

Auramine O, II, G
Brilliant Phosphine 5 G, 3 G
,, ,, G
Rhodamine 6 G, G, B
Safranine G 000, B 000
Victoria Blue 4 R, B
Brilliant Victoria Blue RB
Violet 3 R—4 B

---

## Dyestuffs which may be added to *Alkaline Potassium Sulphite Discharges* for the production of Coloured Effects.

Cotton Yellow CH
Acid Congo R
Chlorantine Violet B, R
Chlorantine Lilac B, BB, R
Acetylene Blue 6 B
Direct Light Blue 550
Direct Sky Blue, green shade

---

A useful method which is employed in the production of white patterns on a ground of basic dyestuffs (generally dark blue) is the

## Antimony Resist.

The goods are printed with the following resist paste :—

6 lbs. Antimony Salt,
6 lbs. Zinc Sulphate,
18 lbs. Burnt Starch,
3 gallons water ; boil, and when cold add
6 lbs. Antimony Oxide 50% paste.

After drying, the goods are padded with the requisite basic colour, dried, steamed, and subsequently treated like ordinary printed goods.

In the places where the resist has been printed on the cloth the colouring matter is not fixed, producing white patterns on a coloured ground.

Coloured patterns may be obtained by the addition of suitable direct cotton colours to the resist paste.

The following colours are suitable for this purpose :—

Chlorantine Yellow JJ and JG.
Cotton Yellow CH.
Direct Orange G and R.
Acid Congo R.

One of the most recent methods of producing white and coloured patterns on goods which have been dyed with basic dyestuffs is the

### Oxidation Discharge Method,

the principal features of which we shall now proceed to describe.

### Discharge for White.

3½ lbs. British Gum,
3 pints water,
1 lb. Sodium Chlorate,
2½ ozs. Potassium Bromate, dissolve warm, then add
2½ ozs. Red Prussiate of Potash,
1½ pints Sodium Citrate 76° Tw.

For coloured discharges the same discharge is used, with the addition of 1 dr.—10 ozs. of some direct cotton dyestuff which withstands the action of oxidising agents.

Goods printed with the above discharge are steamed 1 hour, soaped in the open width, and washed. If the sodium citrate is replaced by citric acid a simple passage through the Mather-Platt suffices, but in this case the discharge does not keep so well.

As a good black Noir CN is recommended; aniline black is not suitable for use with this discharge.

The following discharge has also been found useful :—

### Stock Discharge.

1 lb. Sodium Chlorate,
1 pint water,
9 ozs. China Clay,
1 lb. British Gum,
1½ ozs. Red Prussiate of Potash, boil together, cool and add
{ 2¾ ozs. Citric Acid, powdered,
{ ½ pint water.

The coloured discharge is prepared for printing as follows :—

### Discharge for Colour.

4 lbs. Stock Discharge (as described above),
5 lbs. Pigment Colour (Chrome Yellow, Rhodamine Lake, etc.),
2 lbs. Albumen Solution 1/1.

Steam $\frac{1}{4}$ hour.

The following is recommended as a good pink oxidation discharge :—

$\frac{1}{2}$ lb. Sodium Chlorate,
$\frac{1}{4}$ lb. China Clay,
$\frac{1}{2}$ pint water,
$6\frac{1}{2}$ ozs. British Gum, boil ; and when cold add
1 oz. Red Prussiate of Potash,
$1$—$1\frac{1}{4}$ oz. Rhodamine 6 G,
$\frac{1}{4}$ pint warm water,
$1\frac{1}{2}$ oz. Citric acid (powdered),
$\frac{1}{16}$—$\frac{1}{12}$ pint Tannin Acetic Acid 1/1.

In addition to the production of white and coloured patterns on goods dyed with basic dyestuffs, this method may also be applied to goods which have been dyed with alizarin and chrome colours, indigo, and Pyrogene colours.

### Coloured Discharge for Alizarin Dyestuffs.

$\frac{1}{2}$ lb. Sodium Chlorate,
$\frac{1}{3}$ pint water,
7 ozs. British Gum,
$\frac{2}{3}$ oz. Dyestuff, dissolve together, and when cold add
$\frac{2}{3}$ oz. Red Prussiate of Potash,
$1\frac{1}{3}$ oz. Citric Acid (powdered).

Steam 1 hour and wash.

### Coloured Discharge for Indigo.

10 ozs. British Gum,
1 pint water,
$1\frac{1}{2}$—2 ozs. Dyestuff ; boil, and add when cold
9 ozs. Sodium Chlorate and
6 ozs. Ferrocyanide of Tin Paste.

For pale indigo shades this discharge is reduced with British gum thickening containing the necessary amount of the requisite dyestuff.

After printing the goods are passed through the Mather-Platt, and then through a hot 1 % solution of caustic soda, and washed.

### Ferrocyanide of Tin Paste (for the above Discharge).

(1) $2\frac{1}{4}$ lbs. Yellow Prussiate of Potash,
$1\frac{1}{4}$ gallon water.
(2) $2\frac{1}{2}$ lbs. Tin Crystals,
$1\frac{1}{4}$ gallon water.

Mix (1) and (2), filter, wash and press to about 6 lbs. of paste.

For the production of coloured discharges on alizarin dyestuffs and indigo, the same orange and yellow direct dyestuffs are suitable as for the basic dyestuffs.

Gallocyanine is discharged in precisely the same way as the alizarin dyestuffs ; it is applied to goods by padding on the hot flue according to the following recipe, after which the goods are steamed for 1 hour.

### Padding Recipe for Gallocyanine DH 10 % Paste.

$\frac{1}{2}$ lb. Gallocyanine Paste 10 %,
$\frac{1}{2}$ lb. Tragacanth 65/1000,
$\frac{1}{20}$ pint Ammonia,
$\frac{1}{10}$ pint Turkey Red Oil,
1 gallon water,
$\frac{1}{5}$ pint Caustic Soda 76° Tw,,
$\frac{1}{2}$ pint Acetate of Chrome 36° Tw.

Gallocyanine BS and SR are applied in the same way, but without the addition of caustic soda.

## Basic Dyestuffs which can be discharged with Oxidising Agents.

Auramine O, II
,, G
Brilliant Phosphine G
,, 3 G
,, 5 G
do not give a pure white
Patent Phosphine G
,, GG
,, R
Diamond Magenta
Cerise
Rhodamine 6 G
,, S
for pale shades
Violet 3 R—3 B
Ethyl Violet

Crystal Violet 5 BO
Brilliant Violet 6 B
,, 8 B
Victoria Blue 4 R
,, R
,, B
Brilliant Victoria Blue RB
New Victoria Blue GG
Brilliant Glacier Blue
New Fast Green 3 B
,, 2 B
Fast Green O, I
,, JJO
Paper Black GN

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## Direct Cotton Dyestuffs not discharged by Oxidising Agents, suitable for Coloured Discharges.

Chlorantine Yellow JJ
,, JG
Direct Yellow T
Cotton Yellow CH
Chlorantine Orange TR
,, TRR
Chlorantine Brown B, R, BB

Chlorantine Pink
Direct Pink GN
,, BN
Chlorantine Red 4 B, 8 B
Chlorantine Violet
Chlorantine Lilac B, BB, R
Chlorantine Blue B, BB
Chlorantine Pure Blue
Suitable for production of coloured discharges. if the discharge paste is not too strong

# The Discharging of Pyrogene Dyestuffs and Thiophenol Black.

As already mentioned, the oxidation discharge process is very suitable for the production of white and coloured discharges on several Pyrogene dyestuffs, our Pyrogene Blue R and RR, for example, are particularly useful for producing imitation indigo blue and white effects, which, whilst equalling the beauty of white and the fine blue ground obtained with indigo, are greatly superior to it as regards fastness to washing and light, in which respect they are as yet unapproached by any competing product.

Pyrogene Direct Blue, red shade and green shade, may also be discharged by using a rather stronger discharge (Discharge No. 2 is very suitable for this purpose), and give an excellent white. These two colouring matters are especially useful for producing imitations of darker (bronzy) shades of indigo.

In addition to the colours already mentioned, the various brands of Thiophenol Black give, with both discharges, an excellent white, Thiophenol Black T extra and 2 B extra (the former for jet black, the latter for blue black), being very suitable for obtaining a very fine and fast imitation of the Prud'homme style, black and white prints.

Pyrogene Cutch 2 G and Pyrogene Brown D cannot be discharged to a pure white, but give a pleasing shade of cream which is of considerable importance in the printing of velvet and corduroy goods (cap materials and trouserings).

On account of their low cost and simplicity of application, these dyestuffs will undoubtedly form excellent substitutes for several of the dyestuffs now in use; for example, discharges on vat blue and aniline black can be conveniently imitated by the use of these colours.

Our sulphur blacks have two tremendous advantages over aniline black, viz., they do not show the slightest tendency to become green, and the fibre is not attacked by them in the least.

The dyestuffs are applied in the usual way, as already described, on the jigger or on the padding machine; the latter form of apparatus is particularly suitable for dealing with large quantities of goods.

The developing of Pyrogene Blue is carried out according to the apparatus to hand, either by passing the unwashed goods several times through the Mather-Platt, or by after-treating with Eau de Javelle and caustic soda; the brilliancy of the blue developed with Eau de Javelle is greatly increased by a final steaming.

The dyed and developed goods, after washing well and drying, are printed with one of the following discharges:—

### Discharge No. 1.

½ lb. Sodium Chlorate,
½ lb. British Gum,
½ pint water, dissolve, and add
5 ozs. Tartaric Acid (powdered); when cold add
1 oz. Red Prussiate of Potash,
⅒ pint water.

Even better results are obtained with the following:—

### Discharge No. 2.

6 ozs. Aluminium Sulphate,
6 ozs. Sodium Chlorate,
¾ pint water, dissolve, and add
2¾ ozs. Starch,
¼ pint cold water, heat together cautiously for a short time, and when cold add
¾ oz. Red Prussiate of Potash,
⅒ pint water.

Goods printed with either of the above discharges are passed once or twice through the Mather-Platt (or steamed 3—5 minutes), washed and soaped at 70—90° C.

In the case of goods printed with Discharge No. 1, it is recommended to pass the goods, after steaming, through hydrochloric acid $\frac{3}{4}$° Tw.

By adding to Discharge No. 2 certain dyestuffs which withstand the action of oxidising agents (*e.g.*, Cotton Yellow CH, Chlorantine Yellow, Rhodamine 6 G, Methylene Blue) or mineral colours, very useful coloured discharges may be obtained.

The following discharge paste gives a fine yellow :—

1 lb. Discharge No. 2,
$\frac{1}{2}$ lb. Chrome Yellow Paste.

An addition of albumen is unnecessary.

The goods are printed, steamed 15—20 minutes without pressure, washed cold and dried.

# The Discharging of Direct Cotton Dyestuffs.

The discharging of direct cotton dyestuffs may be carried out in two different ways—

(*a*) With Zinc Dust Discharge,
(*b*) With Tin Crystals Discharge.

As belonging to the latter, the following may also be mentioned :—

Tin Acetate Discharge,
Acetol Discharge.

Sulphocyanides and ferrocyanide salts are also added to the tin crystals discharge in order to obtain a better white, especially in the case of dyestuffs which can only be discharged with difficulty.

## The Zinc Dust Discharge.

The zinc dust discharge generally gives the purest white with direct dyestuffs ; it is, however, not very frequently employed, as the zinc dust which it contains has a detrimental action on the engraving of the printing rollers. By thoroughly grinding the zinc dust with the thickening agent this difficulty can be overcome.

The discharge is prepared as follows :—

$\frac{3}{4}$ lb. Zinc Dust,
1 lb. Gum Thickening 1/1 (or Dextrine 1/1),
$\frac{1}{20}$ pint Glycerine ; mix well together, and add
$\frac{1}{4}$ pint Sodium Bisulphite 72° Tw,
$\frac{1}{10}$ pint Ammonia.

After printing, the goods are steamed 1 hour, without pressure, washed well, sometimes also soured in a very dilute bath (1° Tw), and washed again.

If it is desired to steam the goods for a shorter period of time (*e.g.*, by passing through the Mather-Platt), our acetol discharge is to be recommended, as it prints without difficulty, and produces with most dyestuffs a beautiful white, very little inferior to the white obtained with the zinc dust discharge.

### Acetol Discharge.

| | |
|---|---|
| 8—8½ lbs. | Starch Thickening, |
| 1—1¼ lbs. | Tin Crystals, |
| 1⅔ ozs. | Ammonium Sulphocyanide, |
| ½ lb. | Sodium Acetate, |
| 12 ozs. | Acetol. |
| 10 lbs. | |

Steam 10—15 minutes (or pass 2 or 3 times through the Mather-Platt), and wash well.

The zinc dust discharge is never used for producing coloured patterns with direct dyestuffs, the tin discharge being preferable for this purpose.

The discharge paste is prepared with thickening and some basic dyestuff which is not dischargeable by tin salts, and either tin crystals or tin acetate, according to the length of time it is desired to steam the goods, one hour being required for the former, whereas the latter requires but 10—15 minutes.

# Coloured Discharges for Direct Dyestuffs.

### Coloured Discharge.

3—6 ozs. Dyestuff,  
1 pint Acetic Acid 12° Tw,  
1—1½ pint water,  
1—1½ lb. Gum Solution 1/1,  
4—5 lbs. Discharge I or II,  
1—2 pints Tannin Acetic Acid 1/1.  
10 lbs.

### Discharge I (for 1 hour Steaming).

2 pints Tin Acetate 32° Tw,  
1½ lb. Wheat Starch,  
1½ lb. Citric Acid,  
5 ozs. Dextrine; boil a short time, and add  
1¼ lb. Tin Crystals,  
¼ lb. Sodium Acetate,  
½ pint water.

### Discharge II (for a short Steaming).

2 gallons Tin Acetate 32° Tw,  
½ gallon Acetic Acid 12° Tw,  
5 lbs. Starch; boil a short time, and add  
¾ lb. Citric Acid (powdered).

After printing, the goods are steamed for one hour, or 10—15 minutes (passed 2 or 3 times through the Mather-Platt), then passed through a bath containing 5 lbs. tartar emetic per 100 gallons, washed and dried.

Instead of basic dyestuffs, Gallocyanine, with addition of acetate of chrome, may be added to the discharge paste. In the same way, Rhodamine B, G, 3 G and S, and Victoria Blue R, B and BB may be used either in combination with tannin or with acetate of chrome. Discharge pastes prepared with these colours require steaming for not less than one hour.

# Direct Cotton Dyestuffs dischargeable with Tin Crystals or Zinc Dust.

*Cotton Yellow CH
Direct Yellow CR
Direct Orange G
,, R
Cotton Red C
,, 4 B
,, 5 B
,, 6 B
,, 10 B
,, 11 B
,, 12 B
,, D
Chlorantine Red 8 B
*Rosanthrene O, R, A, B, CB
Direct Pink GN
,, BN
Chlorantine Pink
Acid Congo R
Direct Violet C
,, CB
*Chlorantine Violet R, B
Chlorantine Lilac B, BB
Tolamine Violet 2422
Chlorantine Blue B, BB
Chlorantine Pure Blue
Opaline R, 2 G, 5 G
Brilliant Opaline
Direct Blue R, 2 B, 3 B
,, BX, B, R
Acetylene Blue 6 B, 3 B
,, BX, 3 R
Direct Light Blue 550
Direct Sky Blue, green shade
Acetylene Pure Blue
Acetylene Sky Blue
Cotton Blue N
Tolamine Blue 2 B
Direct Indigo Blue BN
,, BNK
,, BK
,, A
Indigen Blue B, BB, R (diazotised)
*Direct Grey R, B, 1474
* ,, 1368, RO
Direct Green B 695, J 1574
*Melantherine BH, 3 G, BO
* ,, M, HW, RO, JH
*Carbide Black S, E, RI
*Direct Black 1602, 1632
* ,, 1640, 1718
*Direct Black CR

Those dyestuffs marked * may only be discharged white in deeper shades with zinc dust, although tin crystals suffices for the production of coloured discharges.

# Basic Dyestuffs which may be added to the Tin Crystals discharge.

Auramine O
,, II
,, G
Brilliant Phosphine 5 G
,, 3 G
,, G
Patent Phosphine M
Diamond Magenta
Safranine G 000
,, B 000
Rhodamine 6 G } and the "extra" brands
,, 5 G }

Violet 3 R—3 B
Ethyl Violet
Crystal Violet 5 BO
Methylene Blue D
Brilliant Glacier Blue
New Fast Green 2 B
,, 3 B
Fast Green JJO
,, O
,, I

# White discharges on Gallocyanine Ground.

In addition to the method of discharging by oxidation, white discharges on Gallocyanine ground can be obtained in the following way.

The white goods are prepared on the padding machine with a solution containing

2 parts Acetate of Chrome, 32° Tw.,
2 parts Caustic Soda, 76° Tw.,
3 parts water ;

they are then allowed to lie 12 hours, after which they are washed well and dried. The chrome mordanted goods are next printed with the following

### Discharge Paste.

2 lbs. Citric Acid,
1½ pints water,
1¾ pints Caustic Soda, 76° Tw.,
2½ lbs. Burnt Starch,
2¼ lbs. Gum Solution, 1/1.

The printed goods are dried, passed 2 or 3 times through the Mather-Platt, then in the open width through a chalk bath at 50—60° C., washed and dyed with 15—20% Gallocyanine paste, with addition of 2—5% acetic acid. The goods are entered cold, raised gradually to boil, boiled ½ hour, washed and soaped.

Both basic and direct dyestuffs are frequently employed in the production of

## Coloured Resists under Aniline Black.

### Aniline Black Preparation.

(a) 25 lbs. Yellow Prussiate of Potash,
10 gallons water.

(b) 14 lbs. Sodium Chlorate,
10 gallons water.

(c) 43 lb. Aniline Salt,
10 gallons water.

Mix (a) (b) and (c), prepare the goods on the hot flue with this mixture, and dry at a moderate temperature.

### Coloured Resists with Basic Dyestuffs.

| | |
|---|---|
| $\frac{2}{3}$—3 | ozs. Dyestuff, |
| 2 | pints water, |
| 2$\frac{1}{4}$ | lbs. British Gum, |
| $\frac{1}{5}$ | pint Glycerine, dissolve together, and add |
| 2$\frac{1}{4}$ | lbs. Acetate of Magnesia, 52° Tw., |
| 1$\frac{1}{4}$ | lb. Acetate of Zinc, 38° Tw., |
| 1 | lb. Zinc White. |

The following recipe also gives excellent results :—

| | |
|---|---|
| 3—8 | ozs. Dyestuff, |
| $\frac{1}{4}$ | pint Acetic Acid, 12° Tw., |
| — | pints water, |
| 3—4 | lbs. Starch Tragacanth thickening, |
| $\frac{1}{2}$ | pint Turkey Red Oil, |
| $\frac{1}{2}$ | pint Olive Oil, |
| 2 | lbs. Zinc White, |
| 1$\frac{1}{2}$—1$\frac{3}{4}$ | lbs. Albumen, |
| $\frac{1}{8}$ | pint Glycerine. |
| 10 | lbs. |

### Coloured Resists with Direct Dyestuffs.

3—6 ozs. Dyestuffs,
4 pints water,
2 lbs. British Gum; boil together, and add
1½ lb. Sodium Acetate, and when cool
1½ lb. Albumen 1/1.

Very pale shades of blue, yellow, etc., can be printed without the addition of albumen.

After printing with the resist the goods are passed through the Mather-Platt, then in the open width through a bath at 30—40° C. containing 5 lbs. soda and 5 lbs. soap per 100 gallons, after which they are washed.

Goods printed with resists containing direct dyestuffs may be chromed in the usual manner.

The basic colours are also applied by another method recently introduced. This consists in printing the white goods with a zinc oxide resist, the aniline black solution being afterwards applied to one side of the fabric only, by means of an endless band of felt. The goods are dried, and the subsequent operations carried out in the usual manner.

# Dyestuffs applicable in the production of Coloured Discharge Effects on Aniline Black.

## Basic Dyestuffs.

Auramine O, II
,, G
Brilliant Phosphine 5 G
,, ,, 3 G
,, ,, G
Rhodamine 6 G
,, 5 G
,, B
And the “extra” brands.
Safranine G 000
,, B 000

Violet B
Crystal Violet 5 BO
Ethyl Violet
New Victoria Blue GG
Brilliant Glacier Blue
New Blue RS
,, ,, BS
For grey
New Fast Green 2 B
,, ,, ,, 3 B

## Direct Dyestuffs.

Cotton Yellow CH
Chlorantine Yellow JJ
,, ,, JG
Chlorantine Orange TR
,, ,, TRR
Acid Congo R

Chlorantine Violet B, R
Chlorantine Lilac B, BB
Direct Light Blue 550
Direct Sky Blue green shade
Acetylene Blue 6 B
Acetylene Sky Blue

## Resists with Basic Dyestuffs under Paranitraniline Red.

The goods are padded in the usual manner with β naphtol, and printed with the following discharge :—

### Coloured Discharge.

$\frac{3}{4}$—$1\frac{1}{4}$ oz. Dyestuff,
$\frac{1}{2}$ pint Acetic Acid 12° Tw,
$1\frac{1}{4}$ lb. Stock Discharge,
$\frac{1}{2}$—$\frac{3}{4}$ pint Tannin Acetic Acid 1/1.

### Stock Discharge.

4 lbs. Tartaric Acid,
4 lbs. Gum Solution 1/1,
5 lbs. Dextrine,
1 oz.—$5\frac{1}{2}$ lbs. Tin Crystals.

After printing, the goods are dried at a moderate heat, hung 12—24 hours in a dark room, developed by passing through a paranitraniline (or a naphtylamine) diazo bath and washed. Sometimes when required for white the goods are passed through a weak souring bath, washed and soaped lukewarm.

Besides these two chief methods of direct printing and discharge and resist printing there are still several other methods of applying the aniline dyestuffs, particularly the direct dyestuffs in printing, which, although not so important as the former, are worthy of mention.

One of the most important of these is the production of

### Mercerised Effects.

The white stuff is printed with a moderately strong printing paste containing caustic soda, which, whilst strong enough to mercerise the cotton, is not so strong as to cause contraction of the fabric. If the goods, after washing, are dyed with direct cotton dyestuffs, the mercerised parts will be found to take up more colouring matter than the unprinted parts, and in this way darker coloured patterns are obtained on a lighter ground. The darker parts can be equally well discharged as the lighter portions by means of tin crystals.

The printing paste is prepared as follows :—

1 lb. Caustic Soda 76° Tw,
½ lb. Tragacanth Paste 65/1000,
½ lb. Gum Solution 1/1.

The goods are printed, washed and dyed with suitable direct cotton dyestuffs. The dyeing operation is commenced with the addition of 2—4 pints Turkey red oil per 100 gallons, without any addition of Glauber's salt or common salt. When the mercerised parts have assumed a sufficient depth of shade the Glauber's salt is added, and the dyeing continued until the ground is sufficiently covered.

Another use for the direct cotton colours in combination with the mercerising process is in the production of

### Creponne Effects.

The white goods, which are generally of the thinnest description (Battiste), are printed with a printing paste prepared with some thickening agent which withstands the action of caustic soda. This also contains direct dyestuffs, and either albumen or acetate of chrome as fixing agent, the latter being specially suitable for the Chlorantine dyestuffs. The goods are steamed (if albumen is used, for 15—20 minutes, if acetate of chrome, 1—2 hours), passed in the open width through the padding machine containing cold caustic soda at 76° Tw, allowed to lie 10—15 minutes, washed thoroughly, and dried on the tentering machine, care being taken that they are not pulled out of shape in any way.

The mercerised stripes contract, causing the production of a crumpled effect in those parts which have been previously printed with the coloured resist.

Before printing with the resist, the goods may be printed or dyed with dyestuffs which withstand the action of caustic soda.

The printing resist pastes are prepared as follows :—

### Resist with Albumen.

| | |
|---|---|
| $\frac{1}{6}$—$\frac{2}{3}$ | oz. Dyestuff, |
| $1\frac{1}{4}$—$1\frac{1}{2}$ | pints water, |
| $6\frac{1}{2}$—7 | lbs. Gum Solution 1/1, |
| 2 —$2\frac{1}{4}$ | lbs. Egg Albumen Solution 1/1. |
| 10 lbs. | |

### Resist with Acetate of Chrome.

| | |
|---|---|
| $\frac{1}{6}$—$\frac{2}{3}$ | oz. Dyestuff, |
| 3 —4 | pints water, |
| 6 —7 | lbs. Tragacanth 65/1000, |
| $\frac{1}{10}$—$\frac{1}{2}$ | pint Acetate of Chrome 36° Tw. (or Acetate of Zinc 36° Tw.) |
| 10 lbs. | |

Another method of application of the direct dyestuffs is the use of the same for padding goods which have already been printed, for the purpose of producing a ground of some pale tint such as cream, pink, pale blue, etc.

## The Padding of Printed Goods during the Finishing Process.

The dyestuff may be either mixed with the size used for finishing, or applied in a separate bath on the padding machine.

The former method is chiefly employed for pale shades on account of its simplicity.

The finishing preparation contains

| | |
|---|---|
| 1 oz.— 1½ lbs. | Direct Dyestuff, |
| 23—30 pints | Turkey Red Oil, |
| 0— 6 ozs. | Soda (or Borax), |
| 30—50 lbs. | White Dextrine, |
| 0— 3 lbs. | Soap (instead of Turkey Red Oil) |

per 100 gallons.

The goods are passed once through this mixture on the padding or starching machine, and dried on the tentering machine.

If it is desired to pad the goods before the finishing operation, an aqueous solution of the dyestuff is employed, with addition of borax or sodium phosphate, according to the directions given under the heading of "Dyeing with Direct Dyestuffs on the Padding Machine."

## Direct Dyestuffs suitable for padding pale shades during the finishing process.

Chlorantine Yellow JJ
,, JG
Direct Yellow T
Cotton Yellow CH
Chlorantine Orange TR
,, TRR
Direct Pink GN
,, BN
Chlorantine Pink
Chlorantine Lilac B, BB
Chlorantine Lilac R

Direct Light Blue 550
Direct Sky Blue, green shade
Acetylene Pure Blue
Acetylene Sky Blue
Acetylene Blue 6 B
Chlorantine Pure Blue
Direct Green B 695
,, J
Direct Grey B
,, R

## The Printing of Cotton Yarn.

In cotton yarn printing, the same dyestuffs and processes as are used in the printing of cotton piece goods, find application. Their use is limited, however, to the direct printing of basic dyestuffs (Noir CN and Gallocyanine are also used), and for very cheap unwashable goods, the direct dyestuffs; the various discharging methods are seldom used, although for better qualities of yarn, the caustic soda discharge (for yarn dyed with basic dyes) and coloured discharges with tin crystals are often used.

Multi-coloured effects are frequently obtained by printing, with basic dyestuffs, on yarn which has previously been dyed with substantive dyestuffs.

The composition of the printing paste is similar to that employed for the printing of piece goods, but it is generally thinner, the consistency varying with the nature of the machine. For the so called multi-colour machine thinner pastes are required, whilst for the one-colour machine the pastes should be thicker.

After printing, the yarn is steamed, and generally woven at once without passage through tartar emetic; such a treatment is of great advantage, and considerably increases the fastness of the woven yarn.

### Usual Recipe for Colour Printing.

| | |
|---|---|
| 1—5 | ozs. Basic Dyestuff, |
| ½—1½ | pints Acetic Acid, |
| — | water, |
| 2¼ | lbs. Tragacanth 65/1000 (or thin starch thickening), |
| ¼—1½ | pints Tannin Acetic Acid, 1/1, |
| 1—2½ | ozs. Tartaric Acid. |
| 10 | lbs. |

After printing, the yarn is steamed one hour, and generally used at once for weaving, without passage through tartar emetic.

### Caustic Soda Discharge for white, on yarn which has previously dyed with suitable basic colours.

5 ozs. Wheat Starch, made into a paste with
1 pint water, and
2 lbs. Gum, 1/1, to which is added, whilst stirring,
2 pints Caustic Soda, 76° Tw., and then
1¾ lbs. Dextrine, dissolved in
3 pints water.

The goods are steamed 5 minutes, rinsed with a lukewarm 1% solution of hydrochloric acid, washed, soaped at 30—40° C., and washed again.

### Coloured Discharges on yarn previously dyed with direct cotton dyestuffs.

The yarn dyed with suitable direct cotton dyestuffs is prepared with a solution containing 20 lbs. tannic acid per 100 gallons, dried and printed with the following discharge :—

| | |
|---|---|
| 2—5 | ozs. Basic Dyestuff, |
| ½—¾ | pint Acetic Acid, |
| 2½—3 | pints Acetate of Tin, 36° Tw., |
| 3—4 | lbs. Gum, 1/1, |
| 2½—3 | ozs. Citric Acid (powdered). |
| 10 lbs. | |

The yarn is steamed 1 hour without pressure, worked for 5—10 minutes in a cold bath containing 5 lbs. tartar emetic per 100 gallons, washed and dried.

The treatment with tartar emetic may be carried out after the preparation with tannic acid; this does away with the necessity of the operation after steaming.

## The Printing of Cotton Yarn with Pyrogene Colours.

| | |
|---|---|
| ¾—1½ | lbs. Dyestuff, |
| — | water, |
| ½—1 | lb. Sodium Sulphide Cryst., |
| 1½—1¾ | lbs. British Gum, |
| (or 2—2¾ | lbs. Dextrine), |
| $\frac{1}{10}$—$\frac{1}{5}$ | pint Caustic Soda, 76° Tw. |

Print with wooden or india-rubber rollers, steam 5—10 minutes, treat with 5 lbs. bichromate of potash at 35—50° C., wash, and pass through a hot soap bath.

# Jute Printing.

# The Printing of Jute.

On account of their excellent fastness to light, the acid dyestuffs are frequently employed in the printing of jute.

The printing paste in such cases is prepared thus :—

| | |
|---|---|
| 3 —5 ozs. | Dyestuff, |
| ½ pint | Acetic Acid, |
| — ,, | water, |
| 6¼ lbs. | Starch Tragacanth Thickening, |
| ½— ¾ pint | Aluminium Acetate 18° Tw. |
| 10 lbs. | |

Basic dyestuffs are printed with tannin, as in the case of cotton goods. In order to obtain particularly bright shades, they are often printed, as are also the acid dyestuffs, on tin-prepared jute.

For this purpose the jute is passed in the open width through a solution of sodium stannate 2½—3° Tw., allowed to lie for 2—4 hours, and then passed through sulphuric acid 1½—2½° Tw., washed well and dried.

Direct dyestuffs are applied to jute in the same way as in the printing of cotton, with addition of borax or sodium phosphate.

In all these cases the printed goods are steamed one hour, without pressure ; the washing after steaming is generally omitted.

# Wool Printing.

# Wool Printing.

## The Printing of Piece Goods.

As the wool fibre possesses reducing properties, which during the steaming process cause a destruction, or at least a decolourising of the printed colouring matter, it is necessary to overcome this disadvantage by a preliminary treatment.

The usual method of accomplishing this purpose is by means of the so-called operation of chloring the wool. In addition to this, a preparation with stannic acid has been found to be advantageous with some dyestuffs, particularly with the Eosines; in some cases the two treatments are combined.

## The Chloring of Wool

is usually carried out in the following manner —

The well-scoured and washed goods are passed twice through the padding machine, which contains per 100 gallons of water—

1 gallon Hydrochloric Acid 35° Tw., or
$\frac{1}{3}$ ,, Sulphuric Acid 165° Tw.,

during the progress of the operation for every 100 lbs. of goods.

2 gallons Bleaching Powder Solution 12° Tw.

are gradually added to the bath.

During the second passage through the machine no addition is made.

The goods are allowed to stand beamed on the roller for two hours, after which they are washed well and dried.

## The Tin Preparation.

The damp goods are passed through a solution of sodium stannate 4½° Tw., allowed to lie one hour, passed through a bath of sulphuric acid 2½° Tw., washed and dried.

As already remarked, the tin preparation is particularly suitable for the Eosines; it also gives, with many other dyestuffs, more brilliant colours, but the shades are not so deep as those produced by the chloring process.

## Preparation of the Printing Pastes.

As thickening agents, most of those usually employed in cotton printing are available; only those thickenings which contain starch are not used in printing piece goods, owing to the difficulty with which such thickenings are removed after printing.

Pastes prepared with British gum as thickening agent have been proved to be most suitable for wool printing, as they give a very clearly defined impression, and, in addition to this, they are very easily removed by washing.

As fixing agents, acids or acid salts are usually employed, and preferably, organic acids. Sulphuric acid is permissible, but is not a desirable addition in the printing of piece goods, as it has a detrimental action on the cotton-back cloths.

The acids chiefly employed are acetic, oxalic and tartaric acids. Recently, lactic acid has been suggested as suitable for this purpose. Alum and aluminium sulphate are also used in many cases. If the dyestuff is easily precipitated by addition of acid, oxalate of ammonia is employed, which splits up during the steaming into ammonia and oxalic acid. Printing pastes containing an addition of ammonia are also used, and with many dyestuffs, *e.g.*, Water Blue, some acid colours, Induline, etc., they give very level results; however, this addition is recommended more for hand-printing, as it is apt to attack the copper printing rollers.

Another addition which is used is that of 6—8 ozs. glycerine per 10 lbs. printing paste. This renders the paste hydroscopic, and does away with the necessity of damping the goods or the back cloth before steaming in many cases.

Occasionally, the preliminary chloring of the wool may be dispensed with by the addition of 2½—3 ozs. sodium chlorate per 10 lbs. printing paste, this is particularly useful in the printing of carpet and other yarns and slubbing, which are not chlored. In the printing of wool piece goods also, particularly in the case of easily oxidisable dyestuffs, an addition of ½—¾ oz. chlorate per 100 lbs. printing paste is advantageous.

After printing, the wool, whilst still damp, is steamed without pressure. Generally, the goods are developed in damped back cloths, and steamed with wet steam ; when using pastes containing glycerine it is not necessary to damp the back cloths.

In wool printing, acid dyestuffs are mostly employed, on account of their fastness to light and rubbing. Basic dyestuffs are also frequently used, the Rhodamines and Victoria Blues being used in very large quantities.

Many direct dyestuffs are also eminently suitable for wool printing, on account of their excellent fastness to water and washing ; they also have the property of producing very clearly defined impressions, which makes them of additional interest.

Usual recipe for wool printing :—

| | |
|---|---|
| 2 —5 | ozs. Dyestuff, |
| ½— ¾ | pint Glycerine, |
| 3 —3½ | lbs. British Gum, or |
| | 5 lbs. Dextrine, or |
| | 6 lbs. Tragacanth, or |
| | 6½ lbs. Gum 1/1, |
| — | pints water, |
| 0 —1 | pint Acetic Acid 8° Tw, |
| 0 —3 | oz. Tartaric Acid (Oxalic Acid, Alum, etc.) |
| 10 lbs. | |

dry, steam damp for ½—1 hour (as described above), and wash thoroughly, if possible, in running water.

Acid dyestuffs are dissolved in water alone, the acid being afterwards added to the cold solution, whereas basic dyestuffs are dissolved with addition of acetic acid.

Basic dyestuffs, when used in large quantities, are apt to stain the white somewhat; this is observed less in unchlored wool (in which case the printing paste contains chlorate) than in wool which has been previously chlored.

Direct cotton dyestuffs are applied in the same way, according to the above directions, but with addition of acetic acid or phosphate of soda.

## Hand Printing.

For block printing, the printing pastes should be thinner, and generally contain rather less colouring matter, otherwise they are prepared in exactly the same way as those intended for use in the ordinary roller machine.

This method of wool printing is still frequently employed, especially for prints consisting of a large variety of colours.

In addition to the recipes already given, there still remain a few printing recipes which are particularly suitable for wool printing, varying a little from the ordinary method of procedure:—

### Recipe for Printing Cochineal Substitute G and 3 B.

1 lb. Dyestuff (paste),
6½ lbs. Gum Solution,
2½ ozs. Tartaric Acid (powdered),
2 pints water.

10 lbs.

The printing paste should be sieved well before use.

## Recipe for Printing Acid Black D, DK and C, Benzyl Black B and 4 B.

| | |
|---|---|
| ½—1 | lb. Dyestuff, |
| 0 — ¼ | pint water, |
| 1½ | lbs. Burnt Starch, |
| 6½ | lbs. Tragacanth 65/1000, |
| $\frac{1}{20}$ | pint Olive Oil, |
| $\frac{1}{20}$ | pint Turpentine, |
| ½ | pint Glycerine ; boil together, and when warm, add |
| ½ | lb. Tartaric Acid (powdered). |
| 10 lbs. | |

# Dyestuffs for Wool Printing.

## Basic Dyestuffs.

Rhodamine 6 G
,, 5 G
,, G
,, B
,, 3 B
,, S
} and the “extra” brands
Diamond Magenta
Violet 4 B—3 R
Crystal Violet 5 BO
Ethyl Violet

Brilliant Violet 6 B, 8 B
Victoria Blue 4 R
,, R
,, B
Brilliant Victoria Blue RB
New Victoria Blue GG
Brilliant Glacier Blue
New Fast Green 2 B
,, 3 B

---

## Acid Dyestuffs.

Naphthol Yellow S
Citronine 000
Azo Yellow O, I
Tartrazine
Orange N, II
,, R, MNO
Acid Brown G, B
Rocceline
Benzyl Bordeaux B
Bordeaux, for wool
Acid Rhodamine R
,, 2 R
,, 3 R
Amaranth G
,, B
Cochineal Substitute G
,, 3 B

Kiton Red S
Ponceau S, for silk
,, 4161
Paper Red PSN, E
Erythrosine B
Eosine JLI
Acid Violet, all brands
Benzyl Violet, all brands
Alkali Violet O, I
Alkali Blue, all brands
Pure Blue, all brands
Water Blue CIII
Navy Blue BW, HH
Navy Blue RIII
Benzyl Blue S
,, B
Night Blue

Kiton Blue
Induline
Grey BB
,, B
,, R
Acid Black D } chief
,, DK } brands
,, HA, C

Benzyl Black B
,, 4 B
Kiton Green
Wool Green S
Anthracene Acid Green
Benzyl Green B
Acid Green O, yellow shade
,, O, blue shade

---

## Direct Cotton Dyestuffs.

Cotton Yellow CH
Direct Orange G
,, R
Acid Congo R
Cotton Red 4 B
Chlorantine Red 4 B
,, 8 B
Chlorantine Pink
Direct Safranine G
,, B
Direct Brown M 617
Cupranil Brown G
,, R
,, B

Chlorantine Violet B
,, R
Chlorantine Lilac BB
,, B
,, R
Direct Blue 2 B
,, 3 B
Acetylene Blue 3 B
,, 6 B
Direct Blue W 104
Direct Light Blue 550
Acetylene Pure Blue
Direct Green B 695
,, G

---

# The Discharging of Wool Piece Goods.

For the production of white and coloured discharges on wool, only those methods come into consideration which depend on the action of reducing agents (tin crystals and zinc dust); zinc dust is only used in rare cases, and tin crystals are generally only used for the production of coloured discharges, as most dyestuffs on wool cannot be discharged pure white, but give at the best a pale cream.

For the production of coloured discharges, the wool is prepared by a very weak chloring operation, which may be carried out either before or after dyeing with the ground colour; if the former method is pursued, uneven dyeings sometimes result, whereas in the latter case, when the goods are afterwards chlored, care should be taken that only such dyestuffs are used as will withstand the action of chlorine.

As dyestuffs for dyeing the ground colour, either direct dyestuffs suitable for wool or acid azo dyestuffs may be employed; such dyestuffs as Acid Green, Acid Violet, Acid Rhodamine, etc., cannot be discharged; these are suitable, however, as are also many basic dyestuffs, for mixing with the tin crystals discharge.

### Stock Discharge.

| | |
|---|---|
| 3½ | lbs. British Gum, |
| 2¾ | pints water, |
| ½ | pint Glycerine, |
| 2½ | lbs. Tin Crystals, dissolve together, and add |
| 1¼ | lb. Sodium Acetate. |
| 10 | lbs. |

## Coloured Discharge.

1½—6 ozs. Dyestuff,
0—3 pints Acetic Acid, 8° Tw. (in the case of Acid Dyes and Eosines, water is used),
7 lbs. above Stock Discharge.
10 lbs.

The dyed and chlored goods are printed, steamed for ¼ hour damp, washed well and dried.

For white the stock discharge is used, usually somewhat reduced; the zinc dust discharge is very seldom employed, generally only for hard printing, and is prepared in the same way as for cotton, but contains rather more glycerine.

It can also be used for obtaining coloured discharges, by addition of dyestuffs which withstand discharging; such are, for example, the various Patent and Brilliant Phosphines, Methylene Blue D and G, Safranine B 000 and G 000, Quinoline Yellow and Primuline.

Multi-coloured effects can also be produced by dyeing with mixtures of dyestuffs, some of which are dischargeable, and some of which withstand the action of discharging agents, the goods being afterwards printed with a tin crystals or zinc dust discharge.

The tin crystals discharge is used in the manufacture of the recently introduced reversible ladies' cloths; in this case, the goods are dyed with dischargeable dyestuffs, then one side of the fabric is printed with a coloured tin crystals discharge, which is of such a consistency that it shall not penetrate to the other side; after steaming and washing, the desired reversible effect is produced.

In the same way, two-coloured felt hats (for ladies' wear), are manufactured.

# Dyestuffs for Wool which can be discharged with tin crystals or zinc dust.

Those marked with an asterisk * can only be discharged with zinc dust.

Those marked with a dagger † are only suitable for coloured discharges.

## Acid and Basic Dyestuffs.

†Azo Yellow O, I
Tartrazine
†Naphtol Yellow S
Citronine 000
Orange MNO
,, II, R
Ponceau S, for silk
,, 4161
Anthracene Red I
Kiton Red S
Rocceline
*Acid Violet
*Pure Blue } all brands
*Water Blue

*Benzyl Blue } all brands
*Benzyl Violet
*Victoria Blue 4 R, R, B
*Night Blue
*†Wool Green S
*Acid Green O, yellow shade
* ,, blue shade
*Benzyl Green B
†Acid Black HA
† ,, D
† ,, DK
† ,, N

---

## Direct Cotton Dyestuffs.

†Cotton Yellow CH
*Direct Orange G
,, R
Acid Congo R
Cotton Red 4 B
*Chlorantine Red 8 B
Direct Purple 104
Direct Brown M
,, V
Direct Blue BX
,, 2 B
,, 3 B
Acetylene Blue 3 R
,, BX
,, 3 B
,, 6 B
Direct Light Blue 550
Direct Sky Blue, green shade
Acetylene Sky Blue
Cotton Blue N
Direct Green B 695
Melantherine BH
,, HW

## Dyestuffs for Wool and Silk Printing, suitable as additions to tin crystals and zinc dust discharges.

Those colours marked with an asterisk * can be mixed with zinc dust discharges, the rest withstand only tin crystals discharges.

Auramine II, O, G
*Quinoline Yellow
*Brilliant Phosphine 5 G
* ,, 3 G
* ,, G
Acid Rhodamine R—RRR
Rhodamine 6 G
,, 5 G
,, G
,, B
,, 3 B
,, S
Diamond Magenta
*Safranine G 000
* ,, B 000
Violet 4 B—3 R
Crystal Violet 5 BO

Ethyl Violet
Alkali Violet
*Methylene Blue D, RND
Victoria Blue B, 4 R
Brilliant Victoria Blue RB
New Victoria Blue GG
Brilliant Glacier Blue
Water Blue CIII
Pure Blue, all brands
New Fast Green, 3 B, 2 B
Fast Green O, I, JJO
Wool Green S
Acid Green O, yellowshade
,, blue shade
Grey B, R, BB
Induline

# The Printing of Wool Yarn.

The process of chloring is not nearly so generally applied on wool yarn as on piece goods; it is, however, frequently used, particularly for weft yarn and in the printing of coloured discharges. The method of procedure is as follows:—

## The Chloring of Wool Yarn.

The yarn is worked in a bath (25—30 times the weight of goods of water), containing 4 gallons bleaching powder solution, 9° Tw. per 100 gallons, an addition of 7 pints sulphuric acid, 165° Tw. per 100 gallons, being gradually made during the course of 1 hour.

Very often, particularly in the case of carpet yarn printing, the chloring process is omitted, the yarn being simply prepared by treating with a solution of alum containing 25 lbs. alum per 100 gallons.

The printing pastes for direct printing are prepared in exactly the same way as for piece goods, but are generally used rather thinner; gum and tragacanth form the most desirable thickening agents, and an addition of glycerine and sodium chlorate (the latter particularly for alum prepared yarn) is usually made. The goods are steamed with damp steam; indeed it is advisable that the yarn should not be perfectly dry before steaming.

Dyed wool yarn is frequently discharged for the production of variegated yarn; in order to increase the brilliancy of the coloured discharge, the goods are generally slightly chlored after dyeing the ground colour.

The discharge pastes are similar to those used for piece goods, differing only in point of consistency.

A typical discharge for this purpose is prepared as follows :—

| | |
|---|---|
| 2½—5 | ozs. Dyestuff (*e.g.*, Auramine II), |
| ½—¾ | pint Acetic Acid, 12° Tw., |
| 2½ | lbs. British Gum, |
| — | water, |
| ½ | pint Glycerine, boil together, and add |
| 1 | lb. Tin Crystals, |
| 7 | ozs. Sodium Acetate, |
| 10 | lbs. |

After printing the goods are steamed damp for ¼ hour without pressure, and washed.

# The Printing of Wool Plush, Imitation Skins and Bunting (Flags).

By painting or printing wool (mohair) plush, and other pile goods, peculiar effects are obtained, which are applied in the production of imitations of the various kinds of skins.

The goods are painted by means of rotating brushes, or the dyed pile of the goods is discharged by the same means. In this way, by use of the various methods of direct printing, and white and coloured discharge printing, all kinds of skins can be imitated.

For painting the pile of fabrics a very thin printing paste is employed, which is prepared in the same way as for the printing of ordinary piece goods ; for coloured discharges, tin crystals discharge is used, with addition of basic dyestuffs ; for white, hydrosulphite solution is chiefly employed, although zinc dust discharge may be used for this purpose.

After painting, the goods are steamed and washed.

For printing or painting bunting (flag materials) which have undergone no preliminary treatment, the usual printing pastes are employed, but slightly less thickened.

After printing and drying, the goods are steamed with damp steam in the usual manner, and washed.

Dyestuffs for this purpose, besides being of brilliant shade, should possess good levelling powers, and should also be fast to water and salt solutions, air and light.

## The Printing of Slubbing (Vigoreux Printing).

For printing slubbing, acid, direct and mordant (chrome) dyestuffs are used ; basic dyestuffs also find application in the production of particularly bright shades.

A preliminary treatment of the wool is not usual.

The printing paste is prepared as follows :—

1½—5 ozs. Dyestuff,
1½ lbs. British Gum,
— water ; boil, and add
1½ oz. Oxalic Acid,
1½—3 ozs. Alum (or Aluminium Sulphate),
1½ oz. Sodium Chlorate.

10 lbs.

For direct dyestuffs, the fixing agent most commonly employed is

½—1 pint Acetic Acid 12° Tw.,

and in the case of dyestuffs sensitive to acid—

2½—3 ozs. Sodium Phosphate.

For mordant dyestuffs, the alum is generally omitted, being replaced by three times the quantity of dyestuff of acetate of chrome 36° Tw., or an equal quantity of fluoride of chrome ; the latter addition usually gives bluer and brighter prints.

After printing, the slubbing is dried, not too quickly, steamed with damp steam for ½—1 hour, and washed.

Fast Cloth Blue is printed on slubbing, with the addition of chlorate or bromate of potash and acetic acid or acetate of ammonia. The goods should be very carefully steamed without pressure.

For the production of vigoreux prints on slubbing intended for the manufacture of ladies' dress stuffs, acid and direct dyestuffs are chiefly used ; Rhodamine and Victoria Blue are also frequently employed.

For mélange printing of slubbing intended for worsted suitings, only the mordant dyestuffs and Fast Cloth Blue are suitable, on account of their superior fastness. Benzyl Green B may also be used for this purpose.

# Silk Printing.

# SILK PRINTING.

## The Printing of Silk Piece Goods.

For printing silk, acid, basic and direct dyestuffs are chiefly employed. The composition of the printing pastes is similar to that of the pastes used in wool printing, with the exception that the addition of glycerine or other hydroscopic bodies is omitted, as this is not necessary in silk printing.

The preliminary treatment of the goods to be printed, which is required for wool goods, is usually unnecessary for silk; however, in some cases, a treatment with stannate of soda and sulphuric acid, as described under the heading of "Wool Printing," greatly increases the brilliancy of the printed colour.

As thickening agents, gum arabic, tragacanth paste and dextrine are principally employed; for dark shades also British gum is used. These possess the important advantage of being easily removed from the fabric by a simple washing; as fixing agents for acid and basic dyestuffs, acetic acid or oxalic acid are used; for direct dyestuffs, acetic acid, and for direct dyestuffs sensitive to acids, sodium phosphate. If the prints with basic dyestuffs are required to be particularly fast to water and washing, they are frequently printed, as on cotton, with addition of 2—3 times the quantity of dyestuff of tannin, and passed, after steaming, through a bath containing tartar emetic.

## Usual Printing Recipe for Acid, Basic and Direct Dyestuffs.

$1\frac{1}{2}$—3 ozs. Dyestuff ; dissolve in
$2\frac{1}{2}$—$2\frac{3}{4}$ pints water, and add
$6\frac{1}{2}$ lbs. Gum Solution 1/1,
$\frac{1}{2}$ pint Acetic Acid 12° Tw.

10 lbs.

Dyestuffs soluble with difficulty, particularly direct dyestuffs, are boiled with the thickening (British gum, dextrine) ; with Alkali Blue, Pure Blue, Orange II and IV, Ponceau, Rocceline, Cochineal Substitute, Acid Black and Acid Rhodamine, an addition of $2\frac{1}{2}$—3 ozs. tartaric acid per 10 lbs. printing paste is very beneficial.

The printed goods are steamed one hour without pressure, and washed well.

As already described, to obtain prints fast to washing with basic dyestuffs, 2—3 times the weight of dyestuff of tannic acid, dissolved in acetic acid, is added to the printing paste. The goods, after steaming, are passed through a bath containing 2—3 lbs. tartar emetic per 100 gallons at 30—40° C.

Bleu d'Alsace is also suitable for silk printing, and is thickened in the same way as for cotton. For black, Acid Black D and DK may be used ; but the amount of dyestuff required is considerably greater than that required to produce a black on wool. For small patterns Jute Black has been successfully employed.

# White and Coloured Discharges on Silk Goods.

In silk printing, the zinc dust discharge is much more frequently used than in wool printing; the tin crystals discharge is also suitable for silk, particularly for coloured discharges.

For dyeing the ground colour, acid, basic and direct dyestuffs are used; with zinc dust, all of these give a good white, but it should be noted that, with most basic dyestuffs and several acid dyestuffs, the discharged white, after a time, loses some of its original purity.

For discharging white, the same zinc dust discharge is used as was recommended for cotton, in darker shades the quantities of zinc dust and bisulphite are increased slightly; this may also serve for coloured discharges, if suitable acid or basic dyestuffs be added to the gum solution before the addition of the zinc dust; in this case, it is advisable to omit the addition of ammonia, although this may tend to decrease the stability of the printing paste.

After printing, the goods are steamed for ¾ hour, washed, passed through dilute hydrochloric acid or sulphuric acid, ½° Tw., and washed again.

Fine and useful effects are produced by dyeing with a mixture of dischargeable dyestuffs, and dyestuffs which withstand the action of discharging agents, and printing with white or coloured discharges.

Tin crystals and tin acetate discharges are also applicable in silk printing; they are only suitable for easily dischargeable acid and direct dyestuffs, and their use is limited to the production of coloured discharges.

For such purposes the following discharge is suitable :

### Tin Discharge for Silk.

| | |
|---|---|
| 4½—6 | pints Thick Gum water, |
| 0—1 | pint Acetic Acid, 12° Tw., |
| 1—5 | pints Tin Acetate, 32° Tw., |
| 0—1¼ | lbs. Tin Crystals, |
| 0—½ | lb. Sodium Acetate, |
| 2½—5 | ozs. Citric Acid. |
| 10 | lbs. |

The quantities of tin acetate and citric acid, and the additions of tin crystals and sodium acetate, vary according to the depth of the shade to be discharged ; pale shades are discharged with addition of tin acetate alone.

For coloured discharges, 3—9 ozs. of the requisite dyestuff per 10 lbs. printing paste are dissolved in the thickening.

After printing and drying, the goods are steamed ½ hour, and washed thoroughly.

For the production of white patterns on silk goods, a peculiar method is made use of, which cannot be applied in the printing of the other fibres, namely,

### The Mastic or Wax Resist.

The white silk goods are printed by means of heated blocks, or printing rollers, with a mixture of the following or similar composition :—

| | |
|---|---|
| 9½ | lbs. American Colophonium, |
| ½ | lb. Tallow, |
| 2 | lbs. Bees' Wax, |
| ½—1 | gallon Turpentine. |

The printed goods are brushed over with powdered fullers' earth or talc, dried and dyed for 2—4 hours in a cold bath containing an excess of suitable basic dyestuffs insoluble in benzene.

The stuff is then dried, the resist is removed by washing with benzene, after which the goods are again dried.

The following dyestuffs have proved suitable for this purpose :—

Methylene Blue, Safranine, Rhodamine B, Violet, Crystal Violet 5 BO, and Bismark Brown.

# The Printing of Silk Yarn and Warps.
## (Chiné Printing.)

In the printing of silk yarn, the same dyestuffs and processes are used as in the printing of piece goods. The printing pastes are used considerably thinner in proportion, the consistency differing for various machines. On this account, in order to prevent any running of the printed colour, the yarn to be printed is frequently prepared by treating with a solution of aluminium acetate 1½—2½° Tw.

A commonly used recipe for direct printing is as follows :—

| | | |
|---|---|---|
| 1½—5 | ozs. | Dyestuff, |
| 2 | lbs. | Tragacanth 65/1000 (or 3 lbs. Gum 1/1), |
| — | | water, |
| 2½ | ozs. | Tartaric Acid (or Oxalic Acid). |
| 10 | lbs. | |

Basic dyestuffs are dissolved and printed with addition of acetic acid, in some cases with tannin also. Ammoniacal printing pastes (containing ¼—½ pint ammonia per 10 lbs. paste) are used for acid dyestuffs, and particularly for prints with Alkali Blue ; it is necessary to sour the latter after steaming.

Also for

### Discharges on Silk Yarn,

generally speaking, the same processes serve for this purpose as are employed for piece goods ; the tin crystals and tin acetate discharge is much more extensively employed in this branch of silk printing than for piece goods, owing to the thinner consistency of the printing paste, and to the circumstance that the requirements of the white on silk yarn are not so exacting.

A discharging recipe which is much used is as follows :—

| | |
|---|---|
| 1¾ | pints Tin Acetate, 36° Tw., |
| ¼ | pint Acetic Acid, |
| ¾ | lb. Starch, |
| 1 | lb. Dextrine, |
| 1½ | ozs. Citric Acid, boil together, and when cold add |
| 13 | ozs. Tin Crystals, |
| 5 | ozs. Sodium Acetate. |

Whilst the above recipe is used for white discharges, for coloured discharges the following recipe is employed:

| | |
|---|---|
| 5—8 | ozs. Dyestuff, |
| 2 | pints water (for basic dyestuffs Acetic Acid is used), |
| — | Gum Solution, |
| 6¼ | lbs. White Discharge. |
| 10 | lbs. |

The yarn is steamed ½ hour, washed and finished.

For warp printing (Chiné printing), the same printing pastes are used as for piece goods.

# The Printing of Wool and Cotton Unions.

# The Printing of Wool and Cotton Unions.

There are several methods of working in this branch of textile printing, varying with the nature of the stuff to be printed. Thus we may distinguish the following methods :—

1. Light coloured goods, in which both wool and cotton are apparent on the printed side of the fabric. These are generally chlored in order to increase the affinity of the wool, and printed with basic dyestuffs (with addition of tannin, as for cotton), or with direct dyestuffs, according to the process described below.

2. Stuffs and union felts, which, in consequence of their textile structure, only show wool on the printed side of the fabric. These are treated in the same way as pure wool goods.

3. Goods manufactured from dark coloured shoddy ; these are mostly intended for men's wear. Such goods are generally dyed with direct dyestuffs, and afterwards printed with coloured discharges containing tin crystals or tin acetate, according to the method given under "Cotton Printing," For particularly bright discharges, and for the purpose of discharging ground colours which have been topped with acid colours, the coloured discharge with zinc dust, given below, is frequently employed.

### Printing with Direct Dyestuffs on Union Goods.

| | |
|---|---|
| 2½—6 | ozs. Direct Dyestuff, |
| 3½ | lbs. British Gum, |
| — | water, boil together, and add |
| 8 | ozs. Borax, |
| ¼ | pint Acetic Acid, 8° Tw. |
| 10 | lbs. |

Steam 1 hour at a slight pressure, wash with plenty of water, dry.

## Coloured Discharge with Tin Crystals for Unions.

| | |
|---|---|
| 5—6 | ozs. Basic Dyestuff, |
| ½ | pint Acetic Acid, |
| ½ | pint Glycerine, |
| — | pints water, |
| 2¾ | lbs. Starch Tragacanth thickening, |
| 2½ | lbs. Tin Crystals, |
| 1¼ | lbs. Ammonium Sulphocyanide, |
| ¼ | lb. Citric Acid (powdered), |
| 1—1½ | pints Tannin Acetic Acid, 1/1. |
| 10 | lbs. |

Steam 15—20 minutes, pass through a cold bath containing 3—4 lbs. tartar emetic, per 100 gallons, wash and dry

## Coloured Discharge with Zinc Dust for Unions.

| | |
|---|---|
| 1½—5 | ozs. Dyestuff (Methylene Blue, Safranine, Brilliant or Patent Phosphine), |
| ¼ | pint Glycerine, |
| 3—4 | lbs. Gum 1/1 (or British Gum thickening), |
| — | water, |
| 2½—4 | lbs. Zinc Dust, |
| 1—1½ | pints Bisulphite, 72° Tw., |
| ¼—¾ | pint Tannin Acetic Acid, 1/1. |
| 10 | lbs. |

Steam 1 hour without pressure, pass through a cold bath containing

½ gallon Sulphuric Acid, 165° Tw., or 1½ gallons Hydrochloric Acid, 35° Tw.,
2—4 lbs. Tartar Emetic

per 100 gallons, wash, and dry.

When using direct dyestuffs sensitive to acids, a slight addition of ammonia should be made to the washing water.

For dyeing the ground colour, all direct dyestuffs applicable in union dyeing are suitable, provided they can be discharged with tin crystals or zinc dust.

For mixing with the tin crystals discharge, all basic products given under the heading of "Cotton Printing" may be employed.

# The Printing of Silk and Cotton Unions.

# The Printing and Discharging of Half-Silk.

The printing and discharging of half-silk (silk and cotton union) fabrics is carried out in almost exactly the same way as that of cotton goods. The basic dyestuffs are principally employed, and these are usually applied with addition of tannin, the printing paste being thickened with gum arabic, in order that the lustre of the silk may not be impaired. After steaming, the goods are passed through a solution of tartar emetic, in the usual way. The direct dyestuffs are also employed in the printing of half-silk, and the printing paste in this case is thickened in the same way as for silk printing.

Cheaper goods, which are not washed after printing, are printed with acid or basic dyestuffs, simply thickened with gum arabic or tragacanth, without any further addition.

White and coloured discharges are obtained with zinc dust and tin crystals, or tin acetate. These processes are carried out in the same way as for cotton printing.

Coloured discharges on aniline black on half-silk are occasionally produced by means of the zinc acetate process.

The dyestuffs for printing, discharging, dyeing the coloured ground of discharged prints, etc., are the same as those generally used for cotton printing and silk printing.

# The Printing of Gloria.

# The Printing and Discharging of Union Fabrics of Wool and Silk.

## (GLORIA).

For printing Gloria goods, acid or direct dyestuffs which dye both fibres to the same depth of shade are chiefly employed. (*See page* 223.) They are thickened in the same way as for wool printing, and printed on the goods, which are previously prepared with chlorine, or still better, with stannic acid.

The steaming process follows in the usual manner as for wool, and the same methods for discharging are applicable as those in use for pure woollen goods.

# Appendix.

# Pyrogene Indigo.

Under the above name we have lately introduced a new Sulphur dyestuff, which is greatly superior to Indigo as regards its properties of fastness.

We are confident that our Pyrogene Indigo will prove a serious competitor to Indigo in cotton dyeing, and the reports we have received from those of our customers who have given it a trial confirm us in this opinion.

In addition to its beautiful shade, which excels that of Indigo in brilliancy, and its fine overhand appearance, which approaches that of the basic dyestuffs, its exceptionally low price renders it much more economical than Indigo and all its substitutes.

As already stated, Pyrogene Indigo possesses both in light and dark shades, a very fine, bright Indigo shade, a brilliant overhand appearance, and great covering power. It is very easily applied, and requires no after-treatment.

As regards its fastness to washing, milling, acids, boiling and light, it may be classed as excellent. As is the case with all Sulphur dyestuffs, the fastness to chlorine is poor.

It is particularly worthy of note that Pyrogene Indigo retains its fine greenish blue shade on washing, whereas many of the ordinary Sulphur Blues acquire an objectional reddish tone on washing.

Pyrogene Indigo may be combined with our various brands of Pyrogene Direct Blue, green shade and red shade, in all proportions, and all the shades of Indigo now in vogue can be obtained with the help of these products.

Blue shades dyed in this way may be used for all the purposes for which Indigo dyed cotton is employed; they possess considerable importance for the production of coloured woven goods, and for the dyeing of piece goods.

Pyrogene Indigo can be discharged with aluminium chlorate in the same way as Pyrogene Direct Blue, green shade and red shade, and these products form an excellent substitute for Indigo in the production of blue and white discharge effects.

### Dyeing Recipe for Pyrogene Indigo.

For 100 lbs. cotton yarn or loose cotton—
170 —200 gallons water,
1 — 12 lbs. Pyrogene Indigo,
2½— 30 lbs. Sodium Sulphide Cryst. (2½ times the weight of dyestuff),
2½— 3 lbs. Soda Calc. (1½ lb. per 100 gallons).
For pale shades—
8½— 20 lbs. Glauber's Salt Cryst. (5—10 lbs. per 100 gallons).
For full shades—
34 — 60 lbs. Glauber's Salt Cryst. (20—30 lbs. per 100 gallons).

The goods are dyed under the surface of the dye-liquor for one hour, just below the boil (90° C.), wrung out or squeezed off, and allowed to hang for ½—¾ hour in the air without washing. They are then washed well.

In the case of dark shades (6—8% and upwards) it is advisable, after oxidising and washing, to soap the goods at 50—60° C. They are then washed and dried at a gentle heat.

For a standing bath, ⅔ of the original quantity of Pyrogene Indigo and 1½ times this amount of sodium sulphide will be quite sufficient. The additions of soda and Glauber's salt vary according to the amount of water which must be added to bring up the bath to its original volume.

Mixtures of Pyrogene Indigo and Pyrogene Direct Blue are applied in the same way ; but, in this case, the quantities of sodium sulphide and Glauber's salt should be slightly reduced.

When dyeing on the jigger with Pyrogene Indigo, the above recipe may be used, and, in addition, it is recommended to add to the bath 6—10 lbs. dextrine per 100 gallons. After dyeing, the goods are immediately squeezed off, allowed to lie $\frac{1}{4}$—$\frac{1}{2}$ hour, washed, and, in the case of dark shades, soaped.

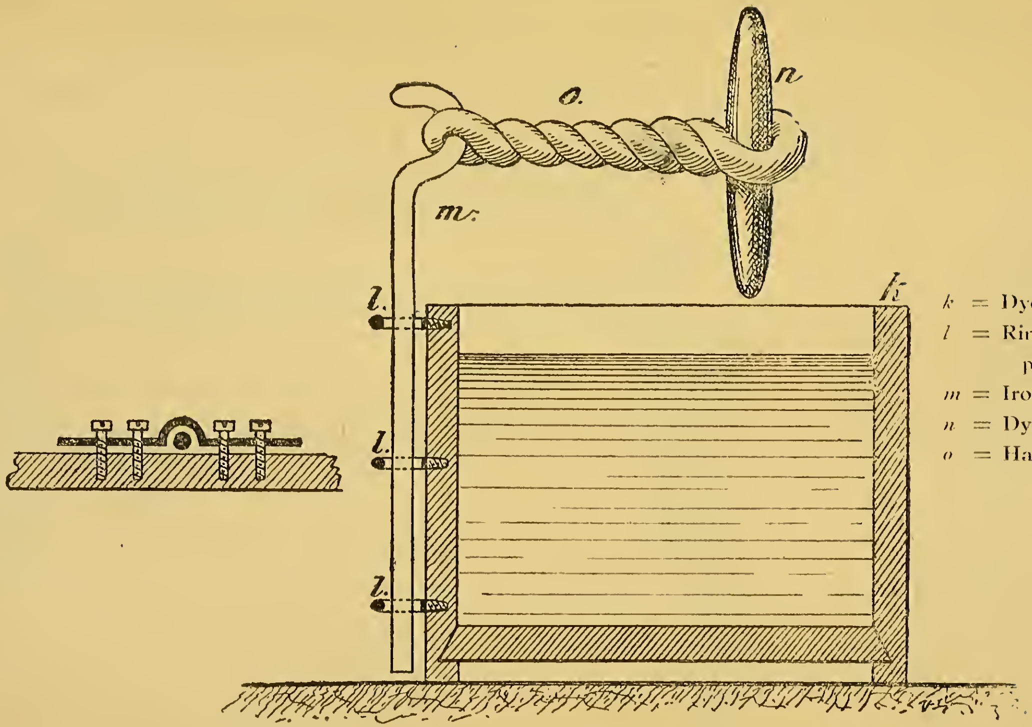
Goods intended for discharging do not require soaping at this stage, as they are soaped after the discharging operation.

# Table for Converting Degrees Centigrade (Celsius) into Degrees Fahrenheit.

| °F. | °C. | °F. | °C. | °F. | °C. |
|---|---|---|---|---|---|
| 32 | 0·00 | 102 | 38·88 | 172 | 77·77 |
| 34 | 1·11 | 104 | 40·00 | 174 | 78·88 |
| 36 | 2·22 | 106 | 41·11 | 176 | 80·00 |
| 38 | 3·33 | 108 | 42·22 | 178 | 81·11 |
| 40 | 4·44 | 110 | 43·33 | 180 | 82·22 |
| 42 | 5·55 | 112 | 44·44 | 182 | 83·33 |
| 44 | 6·66 | 114 | 45·55 | 184 | 84·44 |
| 46 | 7·77 | 116 | 46·66 | 186 | 85·55 |
| 48 | 8·88 | 118 | 47·77 | 188 | 86·66 |
| 50 | 10·00 | 120 | 48·88 | 190 | 87·77 |
| 52 | 11·11 | 122 | 50·00 | 192 | 88·88 |
| 54 | 12·22 | 124 | 51·11 | 194 | 90·00 |
| 56 | 13·33 | 126 | 52·22 | 196 | 91·11 |
| 58 | 14·44 | 128 | 53·33 | 198 | 92·22 |
| 60 | 15·55 | 130 | 54·44 | 200 | 93·33 |
| 62 | 16·66 | 132 | 55·55 | 202 | 94·44 |
| 64 | 17·77 | 134 | 56·66 | 204 | 95·55 |
| 66 | 18·88 | 136 | 57·77 | 206 | 96·66 |
| 68 | 20·00 | 138 | 58·88 | 208 | 97·77 |
| 70 | 21·11 | 140 | 60·00 | 210 | 98·88 |
| 72 | 22·22 | 142 | 61·11 | 212 | 100·00 |
| 74 | 23·33 | 144 | 62·22 | 214 | 101·11 |
| 76 | 24·44 | 146 | 63·33 | 216 | 102·22 |
| 78 | 25·55 | 148 | 64·44 | 218 | 103·33 |
| 80 | 26·66 | 150 | 65·55 | 220 | 104·44 |
| 82 | 27·77 | 152 | 66·66 | 222 | 105·55 |
| 84 | 28·88 | 154 | 67·77 | 224 | 106·66 |
| 86 | 30·00 | 156 | 68·88 | 226 | 107·77 |
| 88 | 31·11 | 158 | 70·00 | 228 | 108·88 |
| 90 | 32·22 | 160 | 71·11 | 230 | 110·00 |
| 92 | 33·33 | 162 | 72·22 | 232 | 111·11 |
| 94 | 34·44 | 164 | 73·33 | 234 | 112·22 |
| 96 | 35·55 | 166 | 74·44 | 236 | 113·33 |
| 98 | 36·66 | 168 | 75·55 | 238 | 114·44 |
| 100 | 37·77 | 170 | 76·66 | 240 | 115·55 |

## Comparative Table of Hydrometer Degrees Beaume and Twaddle.

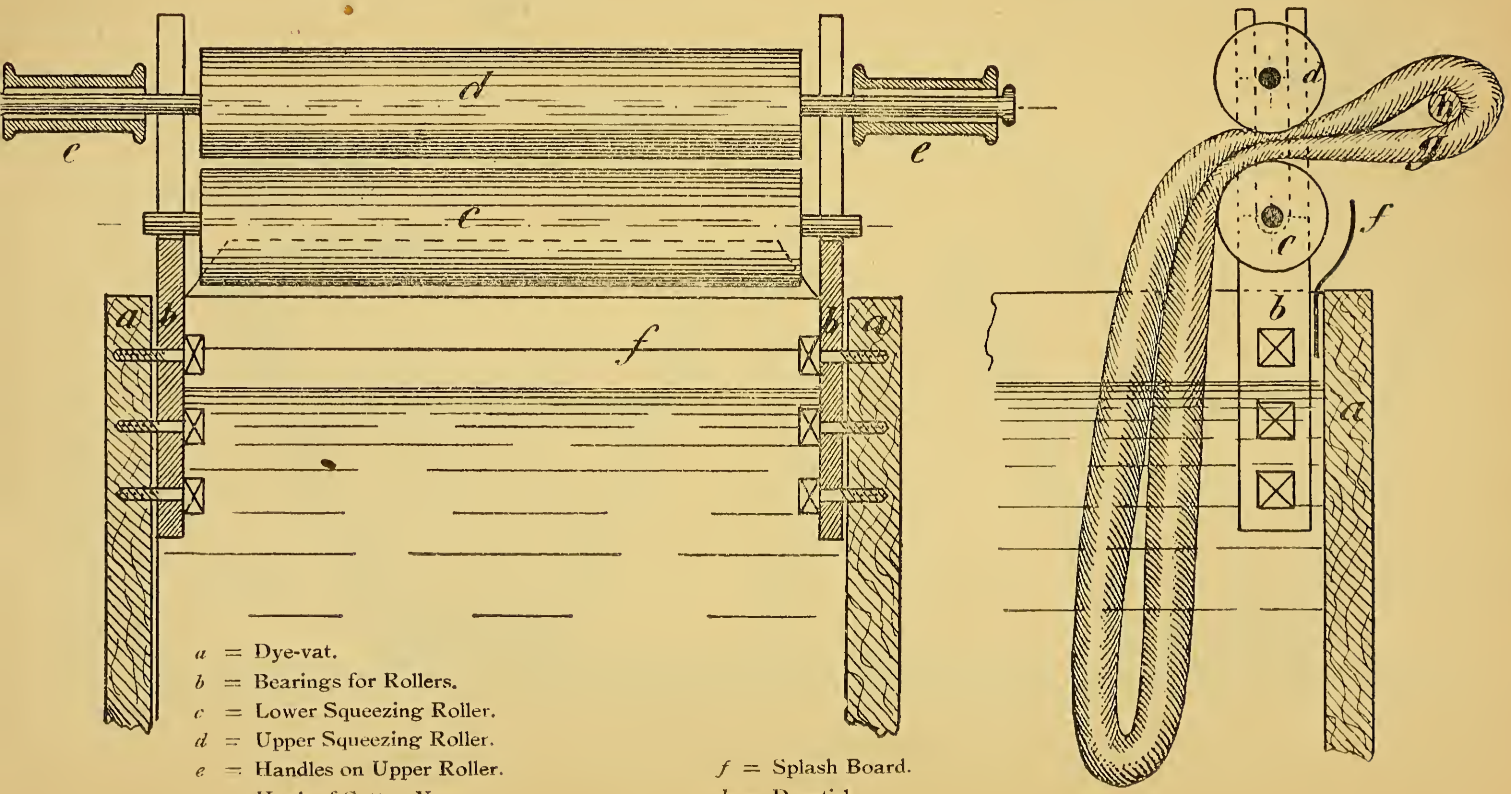
| Be. | Tw. | Be. | Tw. | Be. | Tw. | Be. | Tw. |
|---|---|---|---|---|---|---|---|
| 1 | 1·4 | 18 | 28·4 | 35 | 64·0 | 52 | 112·6 |
| 2 | 2·8 | 19 | 30·4 | 36 | 66·4 | 53 | 116·0 |
| 3 | 4·4 | 20 | 32·4 | 37 | 69·0 | 54 | 119·4 |
| 4 | 5·8 | 21 | 34·2 | 38 | 71·4 | 55 | 123·0 |
| 5 | 7·4 | 22 | 36·0 | 39 | 74·0 | 56 | 127·0 |
| 6 | 9·0 | 23 | 38·0 | 40 | 76·6 | 57 | 130·4 |
| 7 | 10·2 | 24 | 40·0 | 41 | 79·4 | 58 | 134·4 |
| 8 | 12·0 | 25 | 42·0 | 42 | 82·0 | 59 | 138·2 |
| 9 | 13·4 | 26 | 44·0 | 43 | 84·8 | 60 | 142·0 |
| 10 | 15·0 | 27 | 46·2 | 44 | 87·6 | 61 | 146·4 |
| 11 | 16·6 | 28 | 48·2 | 45 | 90·6 | 62 | 150·6 |
| 12 | 18·2 | 29 | 50·4 | 46 | 93·6 | 63 | 155·0 |
| 13 | 20·0 | 30 | 52·6 | 47 | 96·6 | 64 | 159·0 |
| 14 | 21·6 | 31 | 54·8 | 48 | 99·6 | 65 | 164·0 |
| 15 | 23·2 | 32 | 57·0 | 49 | 103·0 | 66 | 168·4 |
| 16 | 25·0 | 33 | 59·4 | 50 | 106·0 | 67 | 173·9 |
| 17 | 26·8 | 34 | 61·6 | 51 | 109·2 | 68 | ... |



k = Dye-vat.
l = Rings for the purpose of supporting the wringing post.
m = Iron wringing post.
n = Dyestick.
o = Hank of cotton yarn.

Wringing Apparatus.

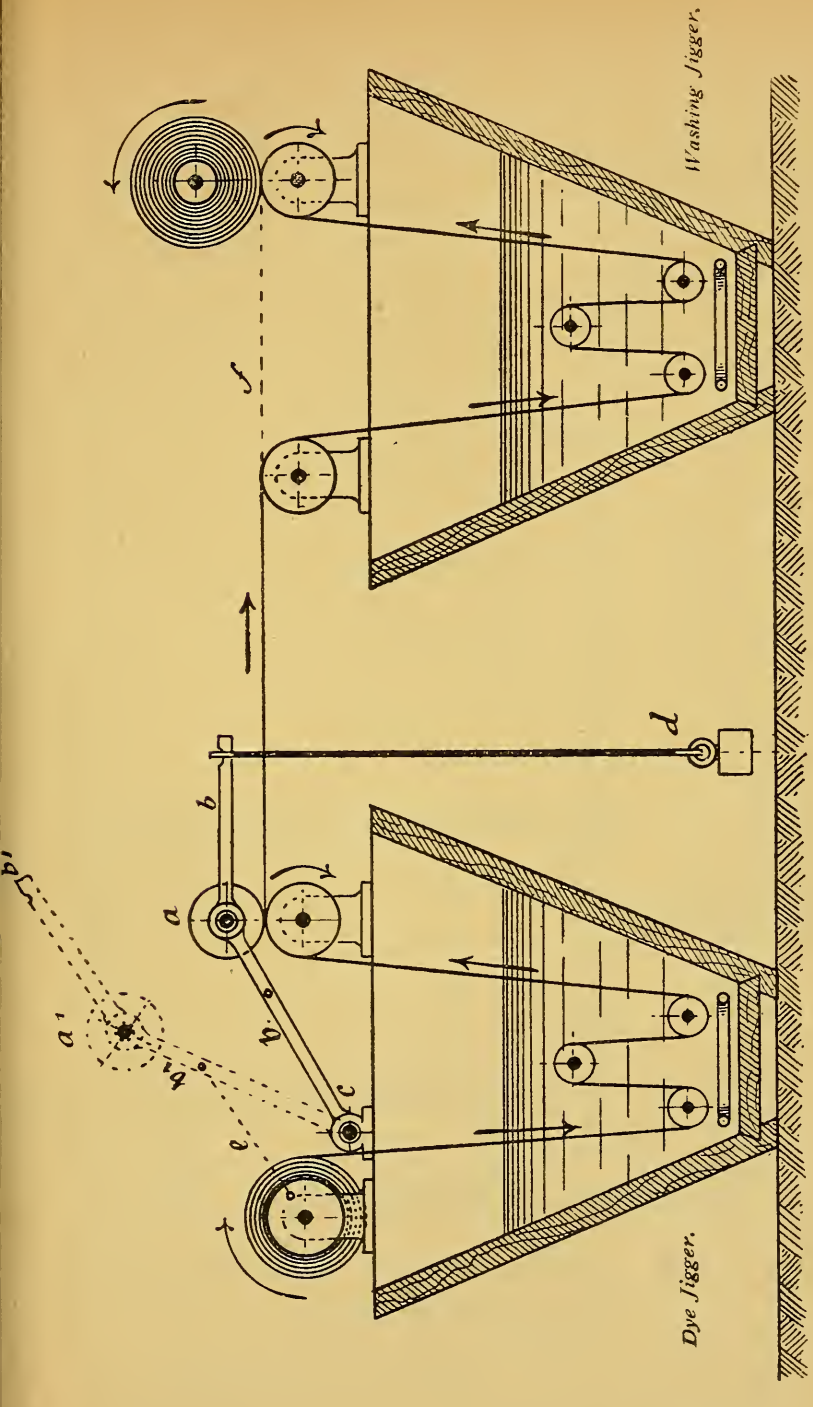
# Squeezing Apparatus attached to Dyevat for Pyrogene Dyestuffs.



FRONT ELEVATION IN SECTION:

END ELEVATION IN SECTION:

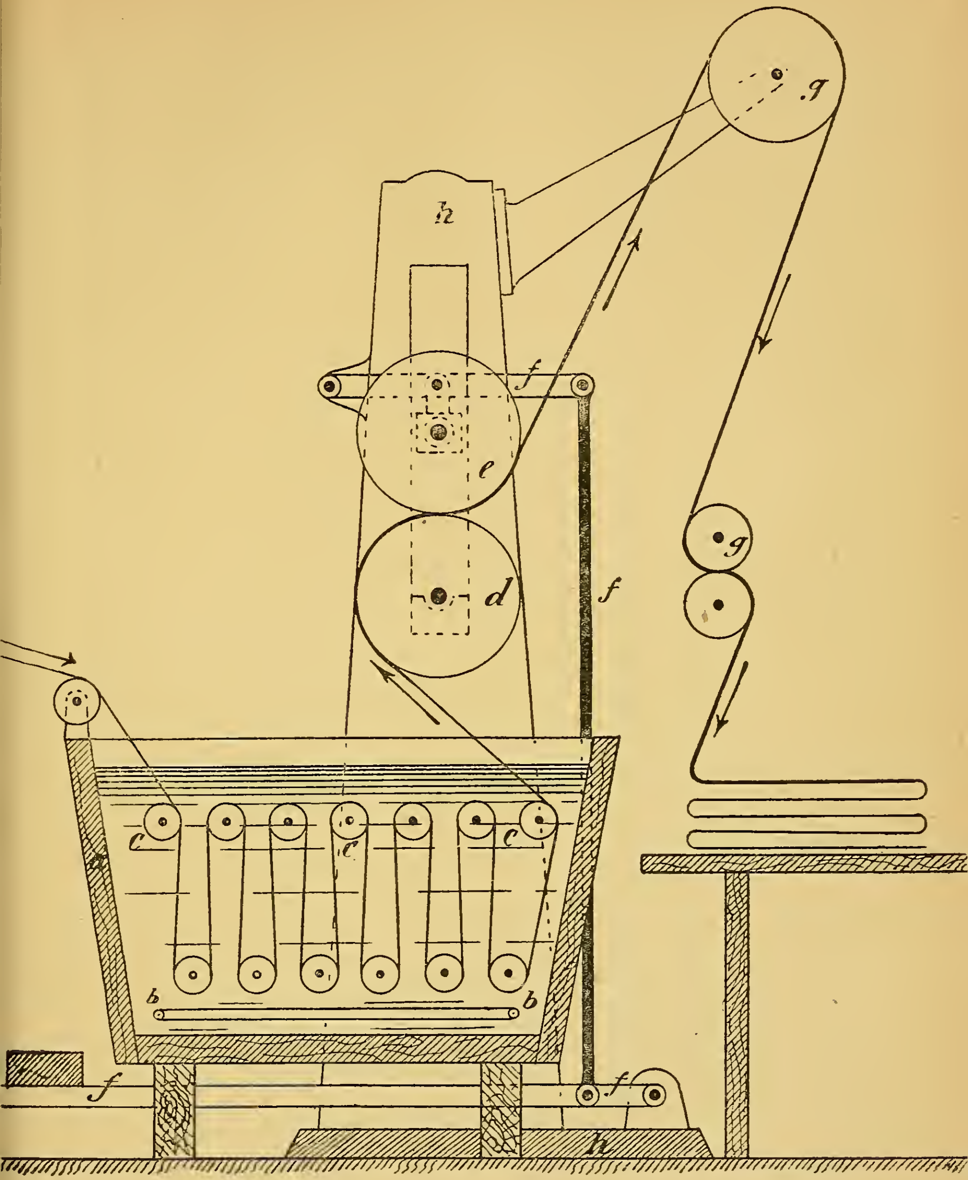
*a* = Dye-vat.
*b* = Bearings for Rollers.
*c* = Lower Squeezing Roller.
*d* = Upper Squeezing Roller.
*e* = Handles on Upper Roller.
*g* = Hank of Cotton Yarn.
*f* = Splash Board.
*h* = Dyestick.



Jigger for Dyeing Piece Goods with Pyrogene Dyestuffs.

(Section).

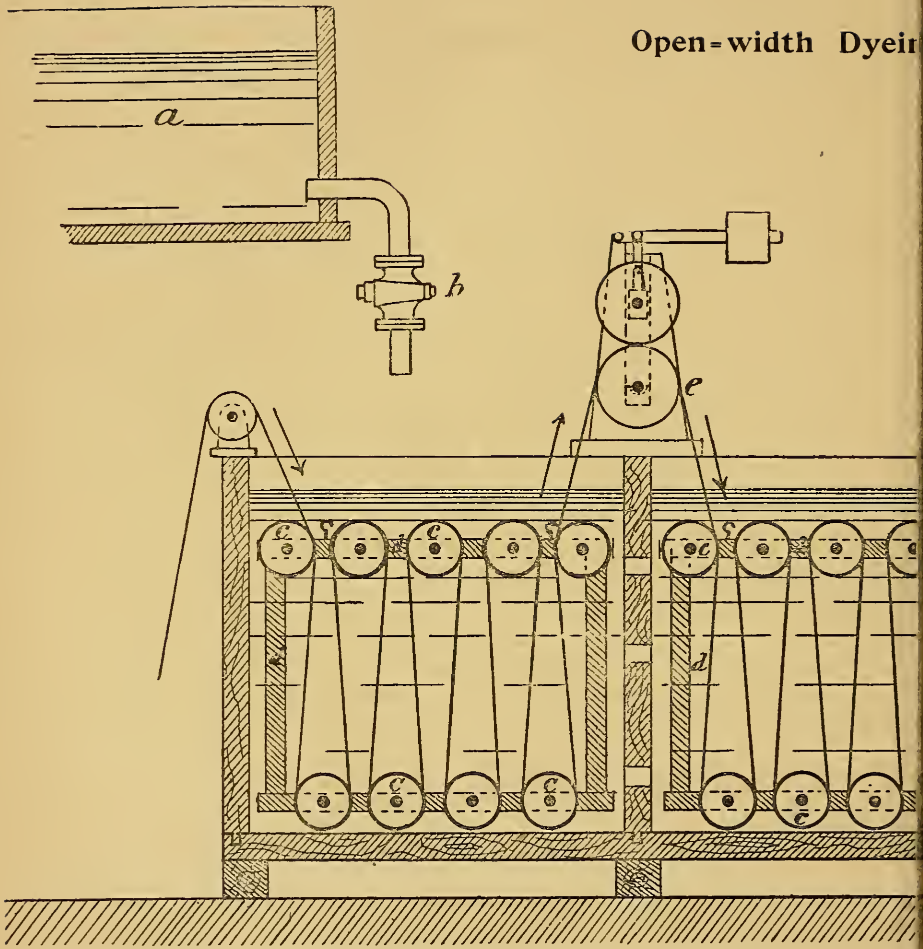
$a$ = Squeezing Roller.
$b$ = Lever for Squeezing Roller.
$c$ = Fulcrum for the Lever.
$e$ = Arrangement for holding up Lever when not in use.
$f$ = Shows method of drawing off goods for developing with damp air (for Pyrogene Blue R).
$a^1$ = Squeezing Roller Raised.
$b^1$ = Squeezing Lever Raised.
$d$ = Weight for Squeezing Roller.



**Padding Machine for Dyeing Piece Goods with Pyrogene Dyestuffs.**

*a* = Wood or Iron Trough, holding 20—40 gallons.
*b* = Closed Steam Coil (iron or lead).
*c* = Guide Rollers.
*d* = Lower Squeezing Roller (to which driving pulley is attached).
*e* = Upper Squeezing Roller.
*f* = Compound Lever for Regulating Pressure on Upper Roller.
*g* = Plaiter Down.
*h* = Frame of the Padding Machine.

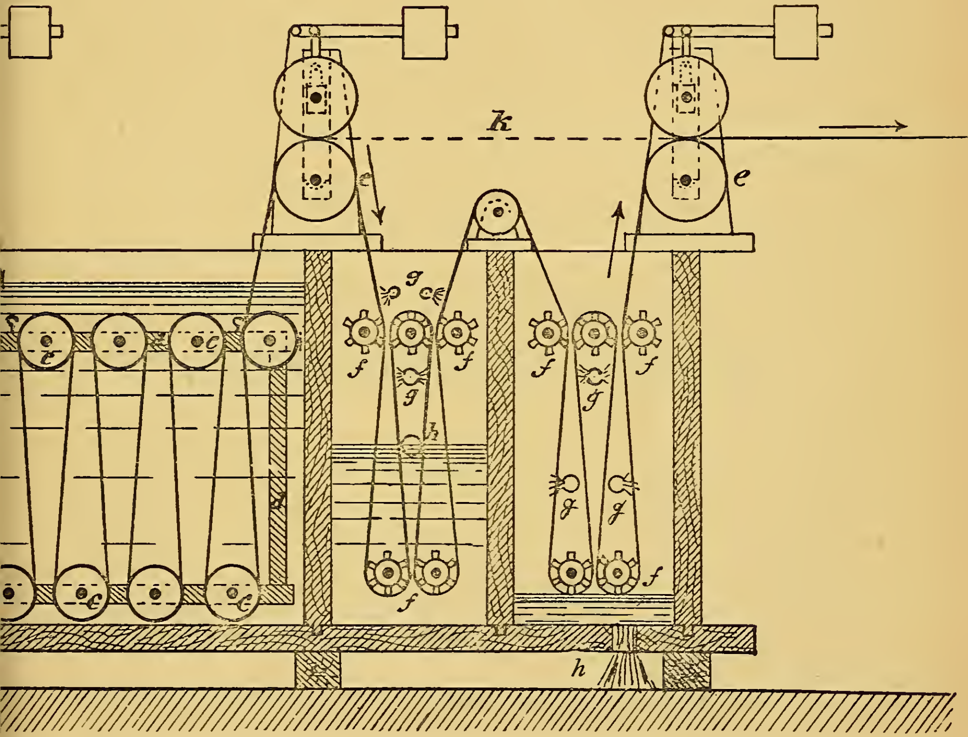
## Open=width Dyei



*a* = Tank for filling Dye Vessels.
*c* = Guide Rollers in Dye-vats.
*e* = Squeezing Rollers.
*g* = Spirt Pipes.
*k* = Shows method of drawing off goods for dev

## achine for Pyrogene Dyestuffs.

(Section.)



*b* = Tap.
*d* = Frame for Guide Rollers.
*f* = Guide Rollers in Washing Boxes.
*h* = Water Outlet.
h damp air (for Pyrogene Blue R).

# Alphabetical Index.

# INDEX.

The numbers printed in full-faced type refer to the tables showing the fastness, those printed in italics to the text and those printed in ordinary type to the grouping of the dyestuffs according to their properties and suitability for various purposes.

Acetate of Alumina - - - - - *18*, *318*
,, Chrome - *102*, *275*, *276*, *277*, *278*, 283, *293*, *300*
,, Iron - - - - - - - *18*
,, Magnesia - - - - - - *304*
,, Soda - - *299*, *300*, *304*, *305*, *329*, *348*
,, Tin- - - - *300*, *314*, *345*, *352*, *358*
,, Zinc - - - - - - *304*, *358*
Acetine - - : - - - - - *272*
Acetol Discharge on Cotton - - - - - *299*
Acetylene Blue - **38**, **40**, 113, 115, 168, 170, 172, 188, 195, 203, 205, 206, 217, 223, 240, 284, 289, 301, 306, 311, 328
Acid, Fastness of Dyestuffs to - **20-51**, **90-109**, 118, **142-161**, **164-167**, 173
,, Black **160**, 168, 169, 171, 173, 175, 187, *326*, 328, 331, *343*
,, Congo **32**, 113, 114, 170, 172, 203, 207, 217, 228, 251, 252, 267, 289, 290, 301, 306, 328, 332
,, Green **156**, 168, 171, 173, 187, 218, 239, 254, 328, *329*, 331, 333

Acid Phosphine - - - - - - - 239
,, Rhodamine *138*, **148**, 169, 173, 187, 189, 205, 223, *329*, 333, *343*
,, Violet *139*, **150**, *163*, 168, 169, 172, 173, 174, 175, 189, 194, 205, 218, 223, 228, 253, 254, 327, *329*, 331
Acid Dyestuffs on Cotton - - - - - *110*
,, ,, ,, Silk - - - - *182*, 187, 189
,, ,, ,, Wool - - - *137-139*, *168-175*
,, ,, ,, other Fibres *129*, 130, *193*, 194, *199*, 205, *211*, 218, *221*, 223, 227, 228, 239, *249*, *257*
,, ,, Printing of, on Cotton - - - *276*
,, ,, ,, ,, on Silk - - 331, 333, 343
,, ,, ,, ,, on Wool *324*, 327, *329*, 331, 333, *342*
After-chroming - - - - - - - *163*
After-tanning - - - - *87*, 116, 117, 118, 186
After-treatment with Formaldehyde - *See Formaldehyde*
,, ,, Metallic Salts - *See Metallic Salts*
,, ,, Paranitraniline *See Paranitraniline*
,, ,, Tannin and Tartar Emetic *See Tartar Emetic*
Albumen, Printing with - - - *280*, *304*, *309*
Alcohol, Solubility in - - - - 262, 264, 266
Alkali, Fastness of Acid Dyestuffs to - - **142-161**
,, ,, ,, Basic ,, ,, - - **90-109**
,, ,, ,, Direct ,, ,, - - **20-51**
,, ,, ,, Mordant ,, ,, - - **164-167**
Alkali Blue *138*, **154**, 171, 173, 175, *182*, 187, *201*, 205, *213*, 218, 223, 327

Alkali Violet **150**, 168, 169, 171, 173, 175, *185*, 187, 189, 205, 327, 333
Alkaline Discharges - - *285*, *286*, 287, *288*, 289
Alpha Naphtol - - - - - - - - 15
Alum - - *71*, *78*, *87*, *88*, *110*, *129*, *323*, *324*, *334*
Aluminium Acetate - - - *See Acetate Alumina*
,, Hydroxide, Precipitation of Lakes with *258*
,, Sulphate - - - *18*, *88*, *249*, *257*, *258*
Amaranth **146**, *163*, 168, 172, 173, 187, 218, 223, 253, 254, 327
Amber Varnish, Solubility in - - - - 263, 265
Ammonia, Acetate of - - - - *137*, *139*, *212*
,, Oxalate of - - - - - - - *323*
Aniline Black, Discharging of - - - - *304*, 306
Anthracene Acid Green - **158**, 168, 169, 171, 172, 173, 205, 328
,, Red - **164**, 169, 172, 173, 174, 205, 240, 331
Antimony Resist under Basic Dyestuffs - - - *290*
,, Salt - - - - - - *84*, *288*
Apparatus Dyeing - - - - - *11*, *58*, *73*, *113*
Artificial Flowers, Dyeing of - - - - - *234*
,, Silk, Dyeing of - - - - - - *193*
,, ,, Dyestuffs suitable for - - 194, 195
Auramine **90**, 117, 118, 130, *136*, 172, 174, 186, 194, 218, 228, 229, 234, 239, 250, 252, 254, 282, *286*, 287, 289, 294, 302, 306, 333, *335*
Azo Yellow 130, **142**, *163*, 168, 171, 172, 173, 187, 189, 194, *213*, 218, 223, 239, 240, 327, 331

Barium Chloride, Precipitation of Lakes with - *257*, *258*

Basic Dyestuffs on Cotton - - - *86*, 116, 117, 118

,, ,, ,, Silk - - - - *183*, 186, 189

,, ,, ,, Wool *135*, 168, 169, 171, 172, 174, 175

,, ,, ,, Other Fibres *121*, *125*, *129*, 130, *193*, 194, *202*, *212*, 218, 222, 223, *227*, 228, 229, *233*, *234*, 234, *237*, *238*, 239, 240, *249*, 250, 252, 253, *257*

Benzene, Solubility in - - - - - - 262, 264

Benzyl Blue - *139*, **152**, 169, 172, 173, 175, *201*, 205, 328, 331

,, Bordeaux - **148**, 168, 169, 171, 172, 173, 174, 175, 187, 205, 218, 223, 327

,, Green **158**, 168, 169, 171, 172, 173, 174, 175, 187, 205

,, Violet - *139*, **152**, *163*, 168, 169, 171, 172, 173, 175, *201*, 205, 218, 327, 331

Beta Naphtol - - - - - - - *15*

Bichromate of Potash - *17*, *56*, *72*, *162*, *163*, *244*, *245*

Bismark Brown - **94**, 116, 186, 194, 218, 228, 229, 234, 239, 250, 282, *346*

Bisulphite - - - - - *278*, *298*, *344*, *353*

Black Acid Dyestuffs - - - - - - **160**

,, Basic ,, - - - - - - **108**

,, Direct ,, - - - - **44-50**

,, Fat ,, - - - - - - 264

,, Mordant ,, - - - - - - **166**

,, Pyrogene ,, - - - - - - *56-67*

,, Spirit ,, - - - - - - 266

Black, Acid *See under the Corresponding Initial Letter*

,, Carbide do.

,, Chrome, Fast do.

Black Direct *See under the Corresponding Initial Letter*
,, Fat do.
,, Indigene do.
,, Jute do.
,, Leather do.
,, Paper do.
,, Pyrogene do.
,, Spirit do.
,, Straw do.
,, Thiophenol do.
,, Union do.
Bleu d'Alsace - - - - - - *277*, 283, *343*
Bleu Fluorescent - - - - - - *154*, 187
Blood Albumen - - - - - - - *281*
Blotting Paper, Dyeing of - - - - - 251
Blue Acid Dyestuffs - - - - - **152-157**
,, Basic ,, - - - - - **102-107**
,, Direct ,, - - - - - **38-43**
,, Pyrogene ,, - - - - - *67-78*
Blue Fast to Lime - - - - - - - *258*
Blue, Acetylene *See under the Corresponding Initial Letter*
,, ,, Pure do.
,, Alkali do.
,, Brilliant Glacier do.
,, Benzyl do.
,, Chlorantine do.
,, ,, Pure do.
,, Cotton do.
,, Direct do.
,, ,, Sky, green shade do.

Blue, Direct Indigo *See under the Corresponding Initial Letter*
,, ,, Light do.
,, Fast do.
,, ,, Cloth do.
,, Fat do.
,, Fluorescent do.
,, Indigene do.
,, Kiton do.
,, Methylene do.
,, Navy do.
,, New do.
,, ,, Victoria do.
,, Night do.
,, Paper do.
,, Pure do.
,, Pyrogene do.
,, ,, Direct do.
,, Spirit do.
,, Tolamine do.
,, Union do.
,, Victoria do.
,, Water do.
"Boiled-off" Liquor Bath with Acetic Acid - *180*, *183*
,, ,, ,, ,, Sulphuric Acid- *182*, *185*
Boiling-off Process, Dyestuffs which withstand the - *180*, 189
Borax - - - - - 1, *12*, *121*, *138*, *201*, *213*
Bordeaux, Chlorantine - - *See Chlorantine Bordeaux*
,, Benzyl - - - - *See Benzyl Bordeaux*
,, for Wool- - - - - - **146**, 326

Bourette Silk - - - - - - - - *179*
Bran Bath, Use of - - - - - - - *222*
Brilliant Glacier Blue - **106**, 130, *136*, 186, 189, 228, 282, *286*, 287, 289, 294, 306, *327*, 333
,, Phosphine - **92**, 117, 118, 186, 194, 218, 228, 229, 239, 282, 287, 289, 294, 303, *330*, 333, *353*
,, Victoria Blue - **102**, 114, 117, 130, *136*, 174, 186, 189, 228, 234, 250, 253, 282, 289, 294, 327, 333
,, Violet - - **100**, 117, 130, 174, 175, 186, 250, 252, 282, 294, 327
British Gum - - - - - *278*, *292*, *293*, *323*
Bromate of Potash - - - - - - *291*, *337*
Brown Acid Dyestuffs - - - - - - **160**
,, Basic ,, - - - - - **94**
,, Direct ,, - - - - - **24-29**
,, Fat ,, - - - - - - **262**
,, Mordant ,, - - - - - - **166**
,, Pyrogene ,, - - - - - - *79*
,, Spirit ,, - - - - - - **266**
Brown, Acid *See under the Corresponding Initial Letter*
,, Bismark do.
,, Catechu do.
,, Chlorantine do.
,, Chrome Fast do.
,, Cupranil do.
,, Direct do.
,, Nitranil do.
,, Pyrogene do.
,, Resorcine do.
Burl Dyeing - - - - - - - - *202*

Calcium Acetate - - - - - - - *277*
Carbide Black - *19*, **48**, **50**, 113, 114, 175, 195, *202*, 204, 206, 223, *249*, 251, 252, 284, 301
Carbon Disulphide, Solubility in - - - *261*, 264
Carbonising, Dyestuffs fast to - - - - 173, 174
Cardinal Red - - - - : - - **94**, 186
Carpet Yarn, Dyestuffs suitable for - . - - 174
„ „ Printing of - - - - - - - *334*
Casein, Printing with - - - - - *280*, 284
Castor Oil - - - - - - - - *273*
Catechu Brown - - - - - 130, 228, 250
„ Imitation of - - - - - - *79*
Caustic Soda - *15*, *68*, *70*, *72*, *73*, *75*, *76*, 84, *279*, *286*, 287, *288*, *293*, *303*, *308*
Cerasine - - - - - - - - **146**
Ceresine Solubility in - - - - - 262, 264
Cerise - - - - - *57*, **98**, 194, 282, 287, 294
Cheeses, Dyeing of - - - - - - *9*, *58*, *73*
China Grass, Dyeing of - - - - - - *123*
Chlorantine Blue - - **42**, 114, 116, 188, 217, 251, 267, 294, 301
„ Brown - - **24**, 113, 114, 115, 130, 188, 195, 205, 267, 294
„ Lilac - - **36**, 113, 114, 115, 116, 188, 195, 206, 217, 223, 284, 289, 294, 301, 306, 381, 328
„ Orange - - **24**, 113, 116, 188, 195, 217, 267, 284, 294, 306, 311
„ Pink - - **34**, 113, 116, 188, 195, 205, 217, 267, 294, 301, 311, 328

Chlorantine Pure Blue - - **42**, 218, 294, 301, 311
,, Red - **32**, 113, 114, 130, 170, 172, 188, 195 203, 206, 207, 217, 240, 251, 267, 284, 294, 301, 328, 332
,, Violet - - **36**, 113, 114, 195, 289, 294, 301, 306, 328
,, Yellow - - **20**, 113, 116, 188, 195, 205, 207, *213*, 217, 240, 267, 284, 290, 294, 306, 311
Chlorate Discharge - - - - *291*, *296*, 294
Chlorine, Fastness to - - - - **20-51**, **90-109**
Chloring of Wool - - - - *322*, *329*, *334*, *352*
Chrome, Acetate of - *112*, *275*, *276*, *277*, *278*, 283, *293*, *299*
,, Alum - - - - *17*, *56*, *57*, *64*, *181*, 188
,, Fast Black- - *163*, **166**, 168, 169, 171, 172, 173, 174, 187
,, ,, Brown - **166**, *163*, 168, 169, 171, 172, 173, 174, 240, *277*
,, ,, Yellow - *163*, **164**, 168, 169, 171, 172, 173, 174, 187, 240, *277*, 281
,, Leather, Dyeing of - - - - - *238*
,, ,, Dyestuffs suitable for - - - 240
,, ,, Black - - - - - - 240
Chrysoine - - - - - - - **144**, 223
Chrysodine - - **94**, 116, 130, 186, 194, 218, 228, 229, 234, 239, 250
Citric, Sodium - - - - - - - *291*
Citrate Acid - - - - - - *291*, *292*, *300*
Citronine - - - **144**, 189, 205, 228, 239, 326, 330
Classification of Dyestuffs - - - - - *3*
Clearing the Silk in Gloria - - - - - *222*

Cocoanut Fibre, Dyeing of - - - - *129*, 130
,, Oil, Solubility in - - - - - 263, 265
Cochineal Substitute - - - **148**, *325*, 327, *343*
Cold Dyeing - - - - - - - - *13*
,, ,, Dyestuffs suitable for - - - - 115
Colour Lakes, Precipitation of - - - - - *257*
Coloured Discharges on Alizarin Dyestuffs - - *292*
,, ,, ,, Aniline Black - - *304*, 306
,, ,, ,, Cotton Yarn - - *313*
,, ,, ,, Half-Silk - - - - *358*
,, ,, ,, Paranitraniline Red - - *307*
,, ,, ,, Silk - - - 331, 333, *344*
,, ,, ,, Wool - - - *329*, 331, 333
,, ,, ,, Unions - - - - *350*
,, ,, with Oxidising Agents *291*, *292*, 294
,, ,, ,, Potassium Sulphite - *288*, 289
,, ,, ,, Tin Crystals and Tin Acetate *300*, 302, *329*, 331, 333, *335*, *336*, *348*
,, ,, ,, Zinc Dust - 331, 333, *344*, *353*
,, Paper, Dyestuffs suitable for - - - 253
,, Woven Goods - - - - - *58*, *82*
Copal Varnish, Solubility in - - - - 263, 265
Cop Dyeing - - - - - - *9*, *58*, *73*, 84
,, ,, Dyestuffs suitable for - - - - 113
Copper Vessels, Avoidance of - - - - *54*, *62*, *140*
,, Sulphate, After-treatment with *17*, *56*, *57*, *72*, *79*, *184*, *140*
Cotton Blue - - - - **42**, 114, 284, 301, 332
,, Dyeing of, in Mechanical Apparatus *9*, *58*, *73*, 84
,, ,, with Acid Dyestuffs - - - *110*

Cotton, Dyeing of, with Basic Dyestuffs - - - *86*
,, ,, with Gallocyanine - - - *112*
,, ,, with Pyrogene Dyestuffs - - *52*
,, After-treatment of Dyed - - - - *14*
,, Loose, Dyeing of - - - - - *9*, *56*
Cotton Piece Goods, Dyeing of, during finishing *310*, 311
,, ,, ,, on the continuous machine *12*, *61*, *76*
,, ,, ,, on the jigger - *10*, *59*, *74*
,, ,, ,, on the padding machine *11*, *62*, *75*
,, ,, ,, on the winch machine *12*, *61*
,, ,, Printing of, with Basic Dyestuffs *271*, 282
,, ,, ,, with Chrome Dyestuffs *277*, 283
,, ,, ,, with Direct Dyestuffs *280*, 284
,, ,, ,, with Noir Reduit *278*
,, Red **30**, **34**, 113, 114, 170, 175, 195, 203, 207, 217, 251, 267, 284, 301, 328, 332
,, Scarlet - - - - - - - **92**, 186
,, Yarn, Dyeing of - - - - - - 72
,, ,, Printing of - - - - - - *312*
,, Yellow **20**, 113, 114, 115, 170, 172, 188, 195, 203, 207, 223, 228, 251, 267, 284, 289, 290, 294, 301, 306, 311, 328, 332
Crystal Violet **100**, 117, 130, *135*, *136*, 168, 169, 171, 172, 174, 175, 186, 194, 218, 228, 229, 234, 250, 252, 253, 254, 282, 285, 287, 289, 294, 302, 306, 327, 333, *346*

Cupranil Brown *17*, **26**, 113, 114, 116, 117, 130, 170, 175, 188 195, 204, 205, 206, 217, 223, 228, 240, 284, 328

Developers - - - - - - - - *15*
,, Mode of dissolving - - - - - *15*
Developing of Diazotised Dyeings *15*, *16*, *80*, *82*, *179*, *216*
,, ,, Pyrogene Blue R and RR with Eau de Javelle - *70*
,, ,, ,, R and RR with damp air - - *68*
Dextrine - - - *11*, *59*, *215*, *288*, *300*, *310*, *313*, *342*
Diamond Magenta **98**, 130, *135*, 168, 169, 171, 172, 174, 175, 186, 194, 218, 228, 239, 250, 252, 253, 282, 287, 289, 294, 302, 327, 333
Diazo Paranitraniline - - - - - - *19*
Diazotising of Direct Dyestuffs - - - - *19*
,, ,, Pyrogene Dyestuffs - - - *80*, *82*
Direct Blue **38**, **40**, 113, 114, 116, 170, 172, 175, 189, 203, 204, 205, 206, 207, 217, 284, 301, 328, 332
,, Dyestuffs on Cotton - - - *7-51*, 113-118
,, ,, Silk - - - *179-181*, 188
,, ,, Wool - - - *133*, 169-175
,, ,, other Fibres *121*, *193*, 194, *199-202*, 203, *212*, 217, *221*, 223
,, ,, Discharging of - *298-300*, 301, 332
,, ,, Printing with - *280*, 284, 328, *352*
,, ,, suitable for discharging 289, 294, 301, 332
,, ,, ,, Cops - - - - 113
,, ,, ,, Gloria - - - *221*
,, ,, ,, Half-Silk - - - 217

Direct Dyestuffs, suitable for Half-Wool - - - - 203
,, ,, ,, Cold Dyeing - - - 115
,, ,, ,, padding during finishing 311
,, Black - - **48**, 113, 114, 116, 175, *202*, 204, 206, 207, 284, 301
,, Green - **50**, 114, 117, 170, 172, 188, 195, 204, 206, 207, 217, 228, 251, 267, 284, 301, 311, 328, 332
,, Indigo Blue - **42**, 113, 116, 175, 204, 206, 207, 217, 284, 301
,, Light Blue - **40**, 130, 170, 172, 188, 205, 217, 223, 251, 284, 289, 301, 306, 311, 328, 332
,, Olive - - - - - - - - **50**, 240
,, Orange **22**, 113, 114, 115, 170, 172, 188, 195, 204, 215, 223, 228, 284, 290, 301, 328, 332
,, Pink - - **34**, 113, 115, 117, 188, 203, 206, 217, 223, 228, 284, 294, 301, 311
,, Purple - - - - - - - - **34**, 332
,, Pyrogene Blue. *See Pyrogene Direct Blue*
,, Safranine - **32**, 113, 114, 115, 170, 172, 175, 188, 195, 203, 251, 284, 328
,, Sky Blue - **40**, 113, 170, 172, 188, 195, 204, 217, 223, 289, 301, 305, 311, 332
,, Yellow - **22**, 114, 115, 116, 117, 170, 172, 175, 188, 203, 205, 206, 207, 217, 228, 250, 251, 294, 301, 311
Dischargeability of Acid Dyestuffs - - - - - 331
,, ,, Basic ,, - *286*, 287, 290, *294*
,, ,, Direct ,, - - - 301, 332
Discharge for Alizarin Dyestuffs - - - - *292*
,, ,, Aniline Black - - - - *304*, 306

Discharge for Indigo - - - - - - *293*
,, ,, Paranitraniline Red - - - - - *307*
,, ,, Pyrogene Dyestuffs - - - - - *295*
Discharging of Cotton with Caustic Soda- *285*, *286*, 287
,, ,, ,, Potassium Sulphite *288*, 289
,, ,, ,, Oxidising Agents - *290*, 294
,, ,, ,, Tin Crystals and Acetol *299*
,, ,, ,, Zinc Dust - - *298*, 301
,, of Cotton Yarn - - - - - *313*
,, ,, Half Silk - - - - - *358*
,, ,, Half-Wool - - - *353*
,, ,, Silk - - - - - - - 331, *344*
,, ,, Wool Piece Goods - - - *329*, 331
,, ,, Wool Plush - - - - - - *336*
,, ,, Wool Yarn - - - - - - *334*
Dissolving Dyestuffs - - - - - - *8*, *53*, *86*
Dyesticks, Bent - - - - - - *53*, *64*

Eau de Javelle - - - - - - - - *70*
Eggs, Dyeing of - - *234*, 234
Egg Albumen - - - - - - - *281*, *292*, *304*
Embroidery Silk, Dyeing of - - - *179*, 186-188
Eosine *138*, **146**, 171, 173, *183*, 187, 228, 234, 250, 253, 254, 258, 267, 283, 327
Erythrosine **146**, 171, 173, 187, 228, 234, 254, 267, 283, 327
Ethyl Tartrate - - - - - - - - *272*
Ethyl Violet **100**, 117, 169, 186, 194, 253, 282, 287, 289, 294, 306, 327, 333

Fastness of Dyestuffs **20-51**, *56-82*, **90-109**, **106-161**, **164-177**

Fastness to perspiration **20-51**, **90-109**. **142-161**, **164-167**, 173
,, ,, stoving - - - - - **142-161**, **164-167**
,, ,, washing - - **20-51**, **90-109**, **142-161**, **164-167**
Fast Cloth Blue - - *139*, **156**, *163*, *169*, 205, *338*
,, Blue MD - - - - - *78*, **104**, 117, 282, 287
,, Yellow - - - **20**, 113, 114, 116, 175, 217, 251
,, Green **108**, 116, 117, 118, 130, 175, 186, 194, *227*
228, 234, 250, 252, 253, 254, *258*, 282, *286*,
287, 289, 294, 302, 333
,, ,, New. *See New Fast Green.*
Fat Dyestuffs, Dyeing of Soap with - - - - *184*
,, ,, Solubility of - - - - - 262-265
,, ,, Use of - - - - - - - *261*
Feathers, Dyeing of - - - - - - - - *233*
Ferrocyanide of Tin - - - - - - - *293*
Ferrous Sulphate - - - - - - - - *245*
Finishing process, Dyestuffs suitable for padding
during the - - - - - - - 311
,, ,, Padding during the - - - - *310*
,, of goods dyed with Alkali Blue *139*, *182*, *201*, *213*
,, ,, ,, Pyrogene Black - - *58*
Flowers, Dyeing of Artificial - - - - - - *234*
Formaldehyde, After-treatment with - - - 48
Fur Dyestuffs, Dyeing with - - - - - - *243*
,, Goods, Dyeing of - - - - - - - *243*
Furniture, Staining of - - - - - *227*, 229
Further use of old baths - *8*, *53*, *60*, *62*, *63*, *68*, *73*, *74*, *75*,
*76*, 84, *138*, *212*

Gallindone - - - - - - - - 281, *291*

Gallocyanine - - *112*, *163*, **164**, *277*, *293*, *303*, *312*
Gallocyanine, Printing and discharging of *277*, *293*, *303*
,, Dyeing with - - - - - *112*
Glauber's Salt - - *7*, *8*, *9*, *10*, *11*, *12*, *53*, *73*, 84, *121*, *125*, *129*, *133*, *135*, *137*, *138*, *179*, *193*, *199*, *201*, *211*
,, ,, Bath, Dyeing in Alkaline - - - *7*
Glycerine - - *273*, *323*, *324*, *325*, *326*, *329*, *334*
,, Solubility in - - - - - 262, 264
Gloria, Dyeing of - - - - - - - *221*
,, Dyestuffs suitable for - - - - - 223
Grey (Acid) **158**, 169, 171, 172, 187, 194, 239, 250, 253, 328, 333
,, Acid Dyestuffs - - - - - - **158**
,, Direct ,, - - - - - - - **50**
,, Pyrogene ,, - - - - - - - *81*
Green Acid ,, - - - - - - **156-158**
,, Basic ,, - - - - - - **106-108**
,, Direct ,, - - - - - - - **50**
,, Fat ,, - - - - - - - 262
,, Pyrogene ,, - - - - - - - *80*
,, Spirit ,, - - - - - - . 266
,, Acid. *See under the Corresponding Initial Letter.*
,, Anthracene Acid. do.
,, Benzyl. do.
,, Direct. do.
,, Kiton. do.
,, New Fast. do.
,, Pyrogene. do.
,, Fast. do.
,, Wool. do.

Guano, Colouring of - - - - - - *258*
Gum, British *278*, *291*, *292*, *293*, *304*, *314*, *323*, *324*, *329*, *335*, *337*, *342*, *352*, *353*
,, Arabic *271*, *286*, *288*, *296*, *300*, *307*, *309*, *313*, *324*, *325*, *342*, *345*, *353*

Half-Silk Black - - - - - - - 217
,, Dyeing of - - - - - - *211*
,, Dyestuffs suitable for - - - - 217
,, One-bath method for - - - - *212*
,, Printing of - - - - - - *358*
,, Pyrogene Dyestuffs on - - - - *215*
,, Shot Effects on - - - - - *214*
,, Two-bath method for - - - - *213*
Half-Wool, Dyeing of - - - - - - *199*
,, Dyestuffs suitable for - - - - 203
,, One-bath method for - - - - *199*
,, Printing of - - - - - - *352*
,, Pyrogene Dyestuffs on - - - - *216*
,, Two-bath method for - - - *201*
Hand Printing on Wool - - - - - - *325*
Hardness of Water - - - - *8*, *53*, *73*, *86*
Hemp, Dyeing of - - - - - - - *125*
Horn Buttons, Dyeing of - - - - - *233*
Hydrosulphite - - - - - - - 336
Hydrochloric Acid - - - - - *14*, *19*, *322*
Hydrogen Peroxide - - - - - *243*, *245*

Indigene Blue - - - - **42**, 113, 116, 118, 188, 301
,, Black - - - **46**, 113, 118, 170, 188

Indigo, Direct Blue. *See Direct Indigo Blue.*
,, Discharging of *293*
,, Topping with *71, 78, 295*
Induline **154**, 169, 173, 174, 187, 239, 254, 328, 333
Inks, Dyestuffs suitable for 254
Ironing, Fastness of Basic Dyestuffs to **90-109**
,, ,, Direct ,, ,, **20-51**

Jigger, Dyeing with Pyrogene Dyestuffs on the *59, 74*
,, ,, Direct ,, ,, *10*
,, Squeezing arrangement for *60*
*See Sketch in Appendix*
Jute, Dyeing of *129*
,, Dyestuffs suitable for 130
,, Printing of *318*
,, Black **108**, 130, 186, 194, *343*
,, Scarlet 130

Kiton Blue **154**, 168, 171, 173, 187, 328
,, Red *139*, **148**, *163*, 168, 171, 172, 174, 187, 223, 327, 331
,, Green **158**, *163*, 168, 171, 173, 174, 175, 187, 218
Lactic Acid *272*
Lakes, Precipitation of *257*
Lard, Finishing with *58*
Lead Acetate *258*
Leather, Dyeing of Chrome *238*
,, Dyestuffs suitable for Chrome 240
,, Dyeing of Bark and Sumac-tanned *237*

Leather Dyestuffs for „ „ „ - - 239
„ Black - - - - - - - **108**, 239
Levelling Dyestuffs for Wool - - - - - 168
„ Properties of Dyestuffs - **142-161, 164-167**
Light, Fastness of Dyestuffs to **20-51**, *52*, *67*, *77*, *80*, *82*,
**90-109 142-161, 164-167**
Lilac, Chlorantine. *See Chlorantine Lilac.*
Linen, Dyeing of - - - - - - - *125*
Linings, Dyeing of - - - - - - - *11*
Lithography, Coloured Lakes for - - - - *258*
Loose Cotton, Dyeing of, with Direct Dyestuffs - *9*
„ „ „ Pyrogene Dyestuffs *56*, *58*, *73*

Magenta, Diamond. *See Diamond Magenta.*
Magnesium Acetate. *See Acetate of Magnesia.*
Malt, Use of - - - - - - - - *275*
Mastic Resist in Silk Printing - - - - - *345*
Matches, Dyeing of - - - - - - *227*, 227
Mechanical Apparatus, Dyeing in - - *58*, *73*, 84, 113
Mercerised Cotton, Dyeing of - - - - - *121*
„ Effects in Printing - - - - *308*
Metallic Salts, After-treatment with *17*, *19*, *56*, *57*, *64*, *71*,
*79*, *81*, 114, *134*, *140*, *163*, *179*, *181*, 188
Metals, Sensibility of Dyestuffs towards **20-51**, *54*, *62*, *140*
Method No. 1 - - - - - - - *7*
„ No. 2 - - - - - - - *8*
„ No. 3 - - - - - - - *14*
„ No. 4 - - - - - - - *17*
„ No. 5 - - - - - - - *19*
„ No. 6 - - - - - - - *52*

Method No. 7 - - - - - - - *86*
,, No. 8 - - - - - - - *87*
,, No. 9 - - - - - - - *88*
,, No. 10 - - - - - - - *110*
,, No. 11 - - - - - - - *110*
,, No. 12 - - - - - - - *111*
,, No. 13 - - - - - - - *112*
,, No. 14 - - - - - - - *133*
,, No. 15 - - - - - - - *135*
,, No. 16 - - - - - - - *136*
,, No. 17 - - - - - - - *137*
,, No. 18 - - - - - - - *138*
,, No. 19 - - - - - - - *139*
,, No. 20 - - - - - - - *162*
,, No. 21 - - - - - - - *163*
,, No 22 - - - - - - - *179*
,, No. 23 - - - - - - - *182*
,, No. 24 - - - - - - - *182*
,, No. 25 - - - - - - - *183*
,, No. 26 - - - - - - - *199*
,, No. 27 - - - - - - - *201*
,, No. 28 - - - - - - - *212*
,, No. 29 - - - - - - - *213*
,, No. 30 - - - - - - - *215*
,, No. 31 - - - - - - - *221*
,, No. 32 - - - - - - - *221*
,, No. 33 - - - - - - - *222*
,, No. 34 - - - - - - - *227*
Methylene Blue *78*, **104**, 118, 186, 194, 218, 228, 229, 234, 239, 253, *258*, 282, 287, 302, 333, 346, 353

Mordant Dyestuffs, Properties of the - - - **164-167**
,, ,, on Cotton - - - - - *112*
,, ,, on Wool - - - - - - *163*
,, ,, in Printing - *277*, 283, *293*, *337*
Mordanting of Cotton with Alum - - - - - *87*
,, ,, ,, Chrome - - - *112*
,, ,, ,, Tannin & Tartar Emetic *86*
,, ,, ,, Stannate of Soda - - *110*
Mordanting of Wool with Chrome - - - - *162*

Naphtol, Alpha - - - - - - - *15*
,, Beta - - - - - - *15*, *80*, *82*
,, Yellow **142**, *163*, 168, 171, 173, 175, 187, 218, 223, 239, *249*, 253, 321, 331
Navy Blue **152**, 168, 171, 172, 173, 174, 187, 253, 326
Neropaline - - - - **46**, 113, 114, 116, 117, 118
New Blue *78*, **104**, 117, 118, 130, 228, 229, 234, *237*, 239, *274*, 282, 287, 306
New Fast Green **106**, 117, 118, 186, 194, 228, 253, *257*, 282, *286*, 287, 289, 294, 303, 306, 327, 333
,, Victoria Blue **102**, 116, 130, *136*, 186, 189, 228, 250, 282, 294, 306, 327, 333
Night Blue - - - - **102**, 172, 187, 267, 328
Nitranil Brown - - - - - 19, **28**, 116, 118
Nitrite. *See Sodium Nitrite.*
Noir CN, C 20 (Noir Reduit) - - *278*, 283, *291*, 312

Oliene, Solubility in - - - - - 263, 265
Olive, Direct. *See Direct Olive*
,, Pyrogene. *See Pyrogene Olive*

Olive Oil, Solubility in - - - - - 263, 265
One-bath Method for Gloria - - - - - *221*
,, ,, ,, Half-silk - - - - *212*
,, ,, ,, Half-wool - - - - *199*
Opaline - - - - - **38**, 114, 175, 284, 301
,, Brilliant - - - - - - **38**, 301
Open-width Machine, Dyeing with Direct Dyestuffs on the - - - - *12*
Open-width Machine, Dyeing with Pyrogene Dyestuffs on the - - - *61*, *76*
Orange Acid Dyestuffs - - - - - **142, 144**
,, Basic ,, - - - - - **90, 94**
,, Direct ,, - - - - - **22, 24**
,, Chlorantine. *See Chlorantine Orange.*
,, Direct. *See Direct Orange.*
,, Acid - - *110*, 130, **142**, **144**, *163*, 168, 169, 171, 172, 173, 175, 187, 189, 194, 205, 218, 223, 250, 253, 254, 267, 281, 327, 331, 343
Oxalic Acid - - - - - - *323*, *324*, *337*
Oxidation Discharges - - - - - *291-296*
,, ,, Dyestuffs suitable for - - 294
,, of Pyrogene Blue R with damp air - - *68*
,, ,, ,, ,, Eau de Javelle - *70*

Padding during the Finishing Process - - *310*, 312
,, Machine, Dyeing with Direct Dyestuffs on the *11*
,, ,, ,, ,, Pyrogene ,, *62*, *75*
Paper, Dyeing of - - - - - - - *249*
,, Dyestuffs suitable for Dyeing - - - 250
,, ,, ,, ,, Staining - - - 253

Paper, Black **108**, 234, 251, 294
,, Blue *249*, 250, 253
,, Red *110*, 130, **146**, 168, 169, 173, 174, 187, 223, 250, 253, *259*, 267, *276*, 283, 327
,, Yellow 250
Paraffin, Solubility in 262, 264
Paranitraniline, After-treatment with *19*
,, Discharging of *307*
Patent Phosphine 79, **90**, 117, 118, 130, 174, 186, 194, 218, 228, 229, *237*, 239, 253, 282, 294, 302, *330*, *353*
Petroleum, Solubility in 262, 264
Phenol *15*
Phosphate, Colouring of *258*
Phosphine, Brilliant. *See Brilliant Phosphine.*
,, Patent. *See Patent Phosphine.*
Phosphate of Soda *7*, *10*, *12*, *280*, *310*, *318*, *342*, *352*
Pigment Colours, Shading of *258*
Pink, Chlorantine. *See Chlorantine Pink.*
,, Direct. *See Direct Pink.*
Ponceau **144**, 168, 169, 172, 173, 187, 223, 228, 254, *258*, *276*, 283, 327, 331
Potassium, Bichromate *See Bichromate of Potash.*
,, Bromate. *See Bromate of Potash.*
,, Sulphite Discharge *288*
,, ,, Dyestuffs suitable for discharging with 289
Primuline *330*
Printing of Cotton Yarn *312*
,, ,, Piece Goods *271-311*

Printing, Recipe for Acid Black - - - - 326
,, ,, Basic Dyestuffs - - - *273*
,, ,, Chrome Dyestuffs - - - *277*
,, ,, Cochineal Substitute - - *325*
,, ,, Direct Dyestuffs - - - *280*
,, ,, Gallocyanine - - - - *277*
,, ,, Noir C N - - - - *278*
,, ,, Pyrogene Dyestuffs - - - *278*
,, ,, Wool - - - - - *324*
Printing of Half-silk - - - - - - *358*
,, Half-wool - - - - - - *352*
,, Jute - - - - - - - *318*
,, Silk Yarn - - - - - - *347*
,, Silk Piece-goods - - - - *342-346*
,, Wool Yarn - - - - - *334*
,, Wool Piece Goods - - - *322-333*
Prussiate of Potash, Red - - - - *291*, *292*
,, ,, Yellow - - - *293*, *296*, *304*
Purple, Direct. *See Direct Purple.*
Pyrogene Blue, Developing of, with warm damp air *68*
,, ,, ,, Eau de Javelle - *70*
Pyrogene Dyestuffs - - - - - **52-82**
,, ,, Printing with - - *278*, *279*, *314*
,, ,, Discharging with - - - *295*
,, Black - - - **56-63**, *84*, 118, *296*, *314*
,, Blue R and R R - **67-76**, *84*, 118, *216*, *295*
,, Brown - - - - - **79**, *84*, 118, *216*
,, Cutch - - - - - **79**, 84, 118, *216*
,, Direct Blue - - - - **77-78**, *84*, 118
,, Green - - - - - - **80**, *84*

Pyrogene Grey - - - - - - - **81**
,, Olive - - - - - **80**, *84*, *216*
,, Yellow - - - - - **82**, *84*, 118, *216*
,, Dyestuffs, Dyeing of, in Apparatus *58*, *73*, 84
,, ,, ,, on the Continuous Machine (*see Sketch in Appendix*) *61*, *76*
,, ,, ,, on the Jigger *59*, *74* (*see Sketch in Appendix*)
,, ,, ,, on the Winch Machine *61*
,, ,, ,, on the Padding Machine *62*, *75* (*see Sketch in Appendix*)
,, ,, ,, in the Vat - *56*, *72* (*see Sketch in Appendix*)
,, ,, ,, of Cotton with - *52-82*
,, ,, ,, of Half-silk with - *216*
Pyrolignate of Iron - - - - - - *18*

Quinoline Yellow **144**, 168, 169, 171, 172, 173, 174, 187, 223, 228, 239, 333
Ramie, Dyeing of - - - - - - - *125*
Rape Seed Oil, Solubility in - - - - 263, 265
Red Acid Dyestuffs - - - - - **144-148**
,, Basic ,, - - - - - **94-98**
,, Direct ,, - - - - - **30-34**
,, Anthracene. *See under the Corresponding Initial Letter*
,, Chlorantine. do.
,, Cotton. do.
,, Kiton. do.
,, Paper. do.
,, Paranitraniline, Discharging of - - - *307*

Resorcine, Developing with - - - - - *15*
,, Brown - - - - - **160**, 187, 239
Rhodamine **96**, **98**, 116, 117, 118, *129*, 130, *135*, *136*, *139*, 169, 171, 172, 174, 175, *183*, 186, 194, 205, *213*, 218, 223, *227*, 228, 234, 250, 252, 253, 254, 267, *273*, *275*, 282, 287, 289, *292*, 294, *300*, 302, 305, 327, 333, 347
,, Acid. *See Acid Rhodamine.*
Roccelline **146**, 169, 171, 172, 173, 174, 187, 194, 205, 213, 223, 228, 327, 331, 343
Rosanthrene - - - - - **34**, 116, 117, 118
Russian Red - - - - - *57*, *79*, **98**, 130, 239

Safranine *57*, **94**, 117, 118, 130, 186, 194, 228, 229, 234, 250, 252, 253, 282, 287, 289, 302, 306, *330*, 333, *347*, *353*
,, Direct. *See Direct Safranine.*
Salt *8*, *10*, *52*, *53*, *54*, *59*, *60*, *61*, *62*, *63*, *68*, *72*, *75*, *76*, *111*, *121*, *212*, *215*
,, Bath, Dyeing in Neutral - - - - - - *8*
Sealing-wax, Colouring of - - - - - - 267
Shoddy, Dyeing of - - - - - - - 175
Shading of Dyeings with Direct Dyestuffs - - *8*
,, Dyestuffs for Pyrogene Dyestuffs - - *54*
Shot effects on Gloria - - - - - *222*, 223
,, on Half-Silk - - - - *214*, 217
,, on Unions (Half-Wool) - - - *202*
Silk, Artificial, Dyeing of - - - - - *193*
,, ,, Dyestuffs suitable for - - - 194
,, Acid Black - - - - - - - 187

Silk, Discharging of - - - - - - *345*
,, Dyeing of, with Acid Dyestuffs - - - *182*
,, ,, ,, Basic Dyestuffs - - - *183*
,, ,, ,, Direct Dyestuffs - - - *179*
,, ,, ,, Pyrogene Dyestuffs - - *181*
,, ,, ,, Spirit and Fat Dyestuffs - *184*
,, Dyestuffs fast to boiling on - - - - *189*
,, Printing of - - - - - - - *344*
,, Yarn, Printing of - - - - - - *347*
Silver Grey - - - - - - - - 251, 253
Skins, Dyeing of - - - - - - - *243*
Skirt Binding (Union) Dyestuffs suitable for - - 206
Sliver, Dyeing of, with Pyrogene Dyestuffs - *58*, *73*, 84
Slubbing, Printing of (Vigoreux) - - - - *338*
Soap, Addition of - - *7*, *9*, *10*, *121*, *136*, *211*, *212*, *310*
,, Dyestuffs suitable for colouring - - - 267
,, Fastness to Washing with **20-51**, **90-109**, 116, 117, **142-161**, **164-167**, 169, 186
Soda Violet - - - - - - **100**, 282, 287
Sodium Acetate. *See Acetate of Soda.*
,, Bisulphite. *See Bisulphite.*
,, Bisulphate - - - *135*, *137*, *138*, *139*
,, Nitrite - - - - - - *14*, *19*
,, Phosphate. *See Phosphate of Soda.*
,, Sulphide - - *52-82*, *84*, *215*, *216*, *179*, *314*
Solubility of Dyestuffs in water - **90-109**, **142-161**, **164-167**
,, Fat Dyestuffs - - - - 262-265
,, Spirit Dyestuffs - - - - - 266
,, Wool Dyestuffs in the hot acid dyebath 168

Spirit Dyestuffs, Dyeing of Silk with - - - *184*
,, ,, Solubility of - - - - - 262
,, ,, Use of - - - - - - *261*
Spirit Varnish, Solubility in - - - 263, 265, 266
Stannic Acid, Preparation of Wool with - - *318*, *322*
Steaming, Dyestuffs Fast to - - - - - 171
,, Fastness to - - - - - **164-167**
Stearine, Solubility in - - - - - 263, 265
Stockings, Dyeing of, with Pyrogene Colours - - *63*
Stoving Colours, Dyeing of, on Wool
with Basic Colours - *136*, 136
Stoving, Dyestuffs fast to - - - - *136*, 172
Straw Black - - - - - - - - **108**, 228
Straw, Dyeing of - - - - - - - *227*
,, Dyestuffs suitable for Dyeing - - - 228
Sulphate of Alumina. *See Aluminium Sulphate.*
Sulphite of Potash, Discharging with, *see Sulphite Discharge*
,, ,, Dyestuffs suitable for Discharging with,
*see Potassium Sulphite Discharge, Dyestuffs for*
Sulphocyanide of Ammonia - - - - - *299*
Sulphuric Acid - - - - *88*, *137*, *139*, *182*, *185*
Sumach - - - - - - *81*, *86*, *199*, *202*

Tallow, Solubility in - - - - - 263, 265
Tannin - *86*, *97*, *121*, *125*, *186*, *202*, *213*, *233*, *257*, *271*,
*273*, *274*, *275*, 282, *285*, *313*, *318*, *342*, *343*, *352*, *358*
,, and Tartar Emetic, Discharging of
Goods mordanted with *285*, 287
,, ,, ,, Mordanting with, *see Tartar*
*Emetic, Mordanting with Tannin and*

Tartar - *162*, *244*, *245*
Tartaric Acid - *272*, *273*, *296*, *323*, *324*, *325*, 326
Tartar Emetic - *86*, *202*, *257*, *275*, *285*, *353*, *358*
,, ,, Mordanting with Tannin and - *86*
Tartrazine - **142**, *163*, 168, 169, 171, 173, 174, 175, 187, 223, 253, 327, 331
Tin Acetate, Coloured Discharges with - *300*, 302, *314*, *344*, *345*, *358*
Tin Crystals, Discharging with *299*, 301, 302, *329*, 331, *335*, *344*, *348*, *353*, *358*
,, Precipitation of Lakes with - *257*
Thiazol Yellow - **20**, 188, 204, 217
Thiophenol Black - *64-67*
Tolamine Blue - **40**, 301
,, Green - 114, 175
,, Violet - **36**, 113, 114, 175, 204, 301
Toluylene Diamine, Developing with - *15*
Topping with Basic Dyestuffs - *13*, *54*, *57*, *71*, *78*, *79*
,, ,, Indigo - *71*, *78*, *295*
Turkey Red Oil *10*, *12*, *58*, *63*, *73*, 84, *87*, *274*, *293*, *304*, *308*, *310*
Turpentine, Developing with, and warm air - *68*
,, Solubility in - 262, 264
Two-bath Method for Gloria - *221*, *222*, 223
,, ,, Half-Silk - *213*, 217
,, ,, Half-Wool - *201*, 203
Union Black - 204, 207
,, Blue - 204, 207
,, Brown - 204, 206
,, Felt, Dyestuffs suitable for - 207

Union Skirt Bindings, Dyestuffs suitable for - - 206

Varnishes, Dyestuffs for Spirit - - - - 264
Vat, Dyeing in the - - - - *12*, *61*, *216*
Vegetable Ivory Buttons, Dyeing of - - - *233*
Velvet, Dyeing of, with Pyrogene Colours - - *60*
Victoria Blue **102**, 116, 117, 118, 130, *135*, *136*, *139*, 168, 169, 171, 172, 174, 175, 186, 189, 218, 234, 250, 252, 253, *275*, 282, 289, 294, *300*, 306, 327, 333
,, Blue, Brilliant. *See Brilliant Victoria Blue.*
,, ,, New. *See New Victoria Blue.*
Vigoreux Printing- - - - - - - *337*
Violet Acid Dyestuffs - - - - - **150-152**
,, Basic ,, - - - - - **98-100**
,, Direct ,, - - - - - - **36**
,, Fat ,, - - - - - - 262
,, Spirit ,, - - - - - - 266
,, Alkali. *See under the Corresponding Initial Letter*
,, Acid. do.
,, Benzyl. do.
,, Brilliant. do.
,, Chlorantine. do.
,, Crystal. do.
,, Direct. do.
,, Ethyl. do.
,, Soda. do.
,, Tolamine. do.
,, (Methyl) **98**, 117, 130, *135*, *136*, 168, 169, 171, 172, 174, 175, 186, 194, 218, 228, 229, 234, 250, 252, 253, 254, *258*, 282, *286*, 287, 289, 294, 302, 306, 327, 333, *346*

Warps, Dyeing of, with Pyrogene Dyestuffs - *57*, *59*, *72*
Washing, Dyestuffs fast to - - 116, 169, 186-188
Water, ,, ,, - - 114, 186-188, 176
,, Blue - - 130, **152**, 228, *276*, 327, 331, 333
,, Glass - - - - - - *7*, *280*
,, Correction of Hard. *See Hardness of Water.*
,, Quantity required for Dyeing *7*, *10*, *52*, *58*, *59*, 84, *137*, *199*, *201*, *202*, *223*
Wax, Solubility in - - - - - 263-265
Weighted Silk, Dyeing of - - - - - *185*
,, ,, Dyestuffs suitable for - - - 189
Winch Machine, Dyeing with Pyrogene Dyestuffs in the *61*
Wood, Staining of - - - - - *227*, 229
Wool, Chloring of - - - - - *322*, *334*
,, Discharging of - - - - *329*, *331*, *334*
,, Dyeing of, with Acid Dyestuffs - - - *137*
,, ,, ,, Basic ,, - - - *135*
,, ,, ,, Direct ,, - - - *133*
,, ,, ,, Mordant ,, - - - *162*
,, ,, ,, Pyrogene ,, - - *134*, *216*
,, Dyestuffs fast to Acids on - - - - 173
,, ,, ,, to Finishing (steaming) on - 171
,, ,, ,, to Stoving on - - - - 172
,, Easy Levelling Dyestuffs for - - - - 168
,, Printing of - - - - - *322*, 327, *334*
,, Stoving Colours on - - - - *136*, 136
,, Green S *139*, **156**, *163*, 168, 169, 171, 172, 173, 174, 175, 187, 194, 205, 223, 328, 331, 333
Wringing Apparatus for Dyeing Pyrogene Dyestuffs on Yarn - - *56*

Xanthine - - - - - - - - - *92*

Yarn Printing, Cotton - - - - - - *312*
,, ,, Silk - - - - - - *347*
,, ,, Wool - - - - - - *334*
Yellow Acid Dyestuffs - - - - - **142-144**
,, Basic ,, - - - - - **90-92**
,, Direct ,, - - - - - **20-23**
,, Fat ,, - - - - - 262, 264
,, Mordant ,, - - - - - - **164**
,, Pyrogene ,, - - - - - - *82*
,, Spirit ,, - - - - - - 266
Yellow, Azo. *See under the Corresponding Initial Letter.*
,, Chlorantine. do.
,, Chrome Fast. do.
,, Cotton. do.
,, Direct. do
,, Fast. do.
,, Fat. do.
,, Naphtol do.
,, Pyrogene. do.
,, Quinoline. do.
,, Spirit. do.
,, Thiazol. do.
Yellow W R - - - - - - **142**, 187, 205

Zinc Acetate, Discharging of Aniline Black with.
*See Aniline Black, Discharging of*
Zinc Dust, Discharging with - *298*, 301, 331, *336*, *344*, *353*, *358*

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